DECEMBER 28, 1959

American Machinist

THE MAGAZINE OF METALWORKING MANUFACTURING

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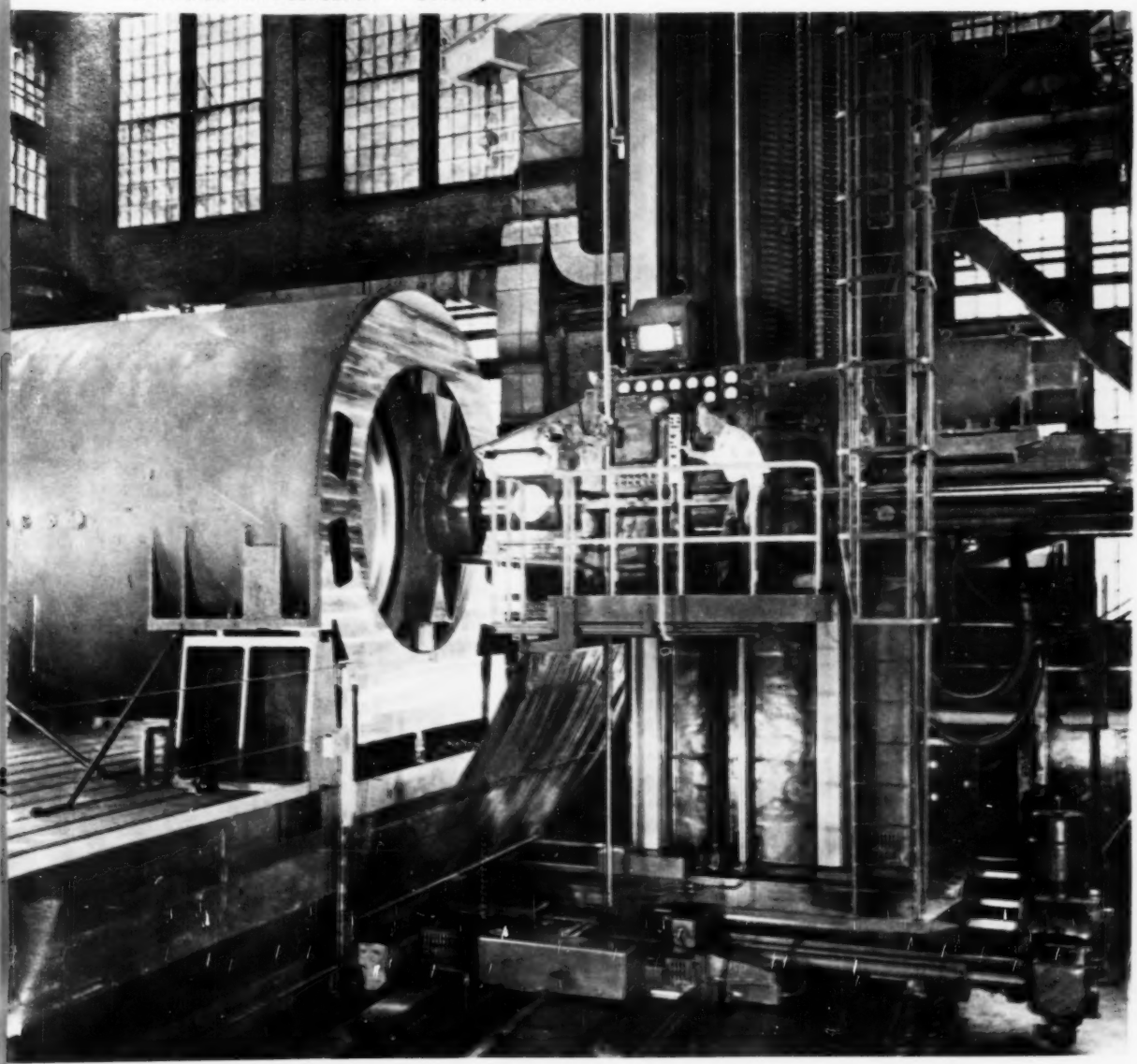


Adjustable floorplates simplify setup on traveling-column machines—see page 78

The classic Taylor machinability curves: **New Shortcut Method** page 69

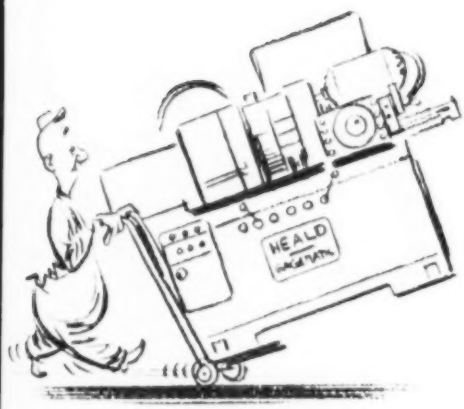
WHY WAIT

longer

for a new machine?

Chances are, Heald has it

IN STOCK!



As a result of Heald's recently instituted stock machine program, the most popular types and sizes of Heald precision finishing machines are normally carried in factory stock at Worcester. Any time you can buy a *stock machine*, and supply your own fixtures and tooling, you get these important advantages . . .

1. FAST DELIVERY. Instead of waiting for several months for a specially built machine, your stock machine will be on its way in a matter of days or weeks.

2. LOWER COST. By eliminating special engineering and drafting, you get a top-quality basic machine at lowest possible cost.

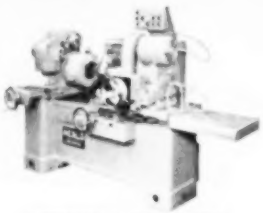
3. UNLIMITED VERSATILITY. Every Heald stock machine has the inherent versatility of speeds, feeds and cycling that permits easy adaptability to virtually any combination or sequence of operations.

If you need a standard machine in a *hurry* — and at minimum cost — it will pay you to check Heald on the availability of a *stock machine* that will meet your requirements.

THESE STANDARD HEALD MACHINES ARE NORMALLY CARRIED IN STOCK

BORE-MATICS

Model "0" Model 421
Model 121 Model 222
Model 221 Model 322
Model 321 Model 422

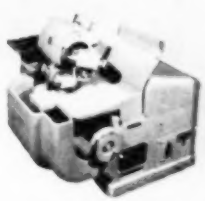


INTERNAL GRINDERS

Model 171 Size-Matic
Model 171 Gage-Matic
Model 271 Plain
Model 271 Size-Matic
Model 271 Gage-Matic
Model 271 Tool Room
Model 272 Basic
Model 273A Universal

ROTARY SURFACE GRINDERS

Model 151 6"
Model 261 16" Plain
Model 261 16" Automatic
Model 361 24" Plain
Model 361 24" Automatic



TOOL SHARPENING MACHINES

Model 3
Model 4

HEALD

THE HEALD MACHINE COMPANY

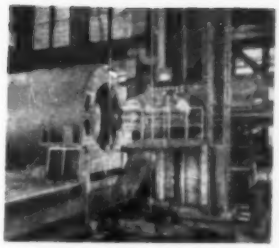
Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York • Syracuse

CRCLE 151 READER SERVICE CARD

COVER:

Ingersoll 8-in horizontal boring, milling, and drilling machine at Allis-Chalmers has adjustable floor plates. Photo by Mike Durante. Details on page 78.



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THE MAGAZINE OF METALWORKING MANUFACTURING

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METALWORKING REPORT

Significant current developments in tooling and production processes

CUTTING

Shortcut to Machinability

Time required to plot the relation between cutting speed and tool life for a given operation may be cut 75% by a new shortcut. The brainchild of Gordon Urquhart of Spring Garden Institute, the new method is a mathematical development of the original Taylor formula ($VT^n = C$) by which it is possible to plot the curves mathematically once the material has been tested briefly.

In proving the shortcut, the new approach has been checked against actual tool-life tests and the correlation has been close (within 1%). Further studies will be needed to determine whether the shortcut will apply when other variables are introduced. That is, whether you can compute the effect of changes in feed, depth of cut, or tool geometry.

Essentially the method consists of two tests for a given flank wear at different cutting speeds. These determine the slope of the Taylor curve. A third test at a different flank wear then establishes the spacing of the curves. With these three points, a complete set of curves for any desired flank wear can be computed mathematically.

Derivation of the new formulas and details of the method are in the article on page 69.

Soundproofed Grinders

A private office for every surface grinder in the shop. That's the new setup at a New Jersey plant that makes precision carbide dies. Each office is air-conditioned, soundproofed, and shadowproof-lighted.

Chief reason for the private offices was to make workers more comfortable. But there are other advantages: An operator can lock his office and leave his equipment as-is; the next morning he doesn't lose time setting up to finish a job. And the operator's isolation (relieved by picture windows in each office) increases his productivity.

For full details on the private offices, see the story on pp 86-87.

FORMING

Flying Press

At 450 strokes a minute, a new, gearless "flying press" developed by the Wean Equipment Corp produces twice that number of silicon-steel line-starter laminations. Installed at Westinghouse Electric Corp's Standard Controls Div (Beaver, Pa), the press is twice as fast as former methods—and holds part tolerances under 0.0003 in. It has enabled one press to replace several slower ones.

Chief reason for the speed is the new principle of operation. Both dies are in constant motion, as is the stock supplied from a coil. The upper die travels in a vertical circle while the lower die oscillates through a vertical arc which synchronizes with the circle. Both dies maintain excellent parallel and lateral relationships—and the shearing, blanking and forming action occurs as the upper die, reaching the low point of its circular path, meets the lower die at the peak of its arc. No gears are used in the drive mechanism.

Successful Extrusion

Vanadium is another metal that doesn't like to be "moved." But because its properties are so useful in the nuclear and chemical industries, a way had to be found to extrude it into seamless tubing.

This has just been accomplished by joint efforts of the Oregon Metallurgical Corp, Albany, Oregon, and the Wolverine Tube Div of Calumet & Hecla, Inc, Allen Park, Mich. Prerequisites were: development of a more pure form of the metal with essential ductility, and a suitable extrusion process.

Vanadium's properties point up why the metal is essential in constructional form, despite a current price of $35 per pound. The material is resistant to hydrochloric and sulfuric acid, and it is 22% lighter than iron. Vanadium jacketing material in sodium-cooled nuclear reactors may permit raising the operating temperature of the reactor by nearly 600 F.

Currently, vanadium oxide is in excess supply as a by-product of uranium refining, and further price reductions can be expected.

Automatic Bender

Any supplier of replacement automotive exhaust and tail pipes is faced with a tremendous inventory problem. Millions of dollars worth of preformed exhaust pipes must be stocked to suit all the many makes and models of vehicles serviced by the supplier. For one manufacturer, the Hamilton Div of Baldwin-Lima-Hamilton Corp has come to the rescue with a numerically controlled pipe bender. Using a General Electric "Mark Series" control system, the machine automatically forms all of the compound bends, and cuts the pipe to the required length from information pre-programmed into a punched card or a tape. The user need store only straight pipe.

This installation is typical of the unique opportunities to create substantial savings with numerical control on short-run non-machine-tool operations.

HEAT TREATING

Residual Stress Cut 80%

Aluminum-alloy parts that are quenched from solution-heat-treating temperature often warp during subsequent machining operations. This is the result of residual stresses set up during quenching.

Just about a year ago the Aluminum Company of America, Pittsburgh, announced that it had devel-

oped a technique for relieving such stresses. Because the stresses are the result of thermal gradients, Alcoa reasoned that if reverse thermal gradients could be set up, reversed stresses might be induced which would cancel the original residual stresses.

Details of the process have now been revealed:

- After quenching, but before too much precipitation hardening has occurred, the part is cooled to a very low temperature. Cooling in liquid nitrogen (–320 F) seems to be most effective.
- Part is then removed from the cooling medium, and the surfaces are blasted with high-velocity steam.
- Finally, the part is aged in the normal manner specified for the particular alloy.

Such a treatment has lowered the residual stress level in water-quenched aluminum-alloy parts by as much as 80% without harmful effects on material properties.

INSPECTION

Tolerance Slide Rule

In the true-position tolerancing method of dimensioning, tolerance callouts on engineering drawings are in terms of a diameter. This diameter describes a circular tolerance zone around the preferred position of a point or feature.

Manufacturing and inspection methods, however, normally employ orthogonal coordinates; that is, movements and measurements are along lines at right angles to each other. To compare coordinates with diameters is easily done, but the conversion is time-consuming and subject to errors.

To eliminate these difficulties, a simple slide-rule device has been developed by design personnel at Sandia Corp, Sandia Base, Albuquerque, New Mexico.

This slide rule, or tolerance comparator, consists of a slide within an 8x10-in. plastic envelope. Windows in the envelope permit quick selection of factors for converting: (1) from a positional tolerance diameter to equivalent coordinates, and (2) from any combination of coordinates to the equivalent tolerance diameter. The range of the device for (1) is 0.001 to 0.126 (even numbers only above 0.014) and for (2) is 0.001 to 0.045.

The slide rule may be obtained from the Office of Technical Services, Dept of Commerce, Washington 25, D C, at a cost of $5.25.

THE OUTLOOK:

As we go into the New Year, it looks as though 1960 will be metalworking's greatest peacetime year. Only dark cloud ahead is possible resumption of the steel strike, but experts are by now pretty well agreed that the twin pressures of public opinion and government disapproval will forestall another strike. *(See p63).*

WELDING

Electroslag Innovation

Flux-cored electrode wire is claimed by Arcos Corp (Philadelphia) as an improvement in electro-slag welding. As originally developed in Russia (*AM*—Jan 12 '59, p106), the process butt welds thick plates vertically, maintaining a molten-slag cover approximately 1½ in. thick over the weld zone. Additional flux drops from a feed hopper as required.

The Vertomatic equipment, imported from Belgium by Arcos, can operate in the same manner, but the company recommends the flux-cored electrode wire because it feeds fresh flux deeply into the weld zone instead of depositing it on top of the slag. The flux in the composite wire weighs 5% of the weight of the metal, a normal proportion for the electro-slag technique (vs equal weights for flux and wire in the submerged-arc process). If the conditions of the weld require extra flux to maintain an adequate slag cover, it is added automatically from a hopper.

ASSEMBLY

Adhesive Bonding Plus Riveting

Adhesive bonding teams up with automatic riveting at Convair-San Diego to build leakproof, integral wing fuel tanks for Convair's 880 and 600 jet transports. The bonding process, in addition to forming leakproof joints, also provides additional structural strength.

The specially built automatic riveters clamp, drill, countersink, insert rivets, head, shave, unclamp, blow chips away, and index the work. See page 88.

FINISHING

Tumble Clean Glass Parts

Glass parts for TV tubes, ¼ in. square and from two to six in. long, can be cleaned by tumbling in a special setup devised by Tumb-L-Matic Inc, Stamford, Conn. Problem was to remove a powder deposit used in heat treating. Unit is completely conveyorized and includes arrangements for separating the impregnated shell compound and returning it to the barrel, as well as for orienting and packaging the finished parts. Production is 1 million parts per 8-hr shift.

Sprayed Vinyl Protects Steel

A sprayable coating based on Union Carbide's Bakelite vinyl resin can protect structural steel and other metal fabrications against corrosion and chemical attack. Available in several colors, it is convenient for color coding instrument tubing, and possesses excellent dielectric properties.

Material has built-in primer and may be applied directly to a clean, dry, scale-free surface; it dries to a tough, durable film in an hour. Conventional spray equipment may be used, but the manufacturer, Quelcor Inc, Chester, Pa, also supplies it in aerosol packages for touch-up work.

MATERIALS & COMPONENTS

Stable Zinc Alloy

A tough, attractive, corrosion-resistant metal has been developed by combining small quantities of titanium and copper with zinc. Called Hydro-T-Metal, the alloy is produced by Hydrometals, Inc, New York, NY. At an initial base price of 30 to 35¢ a lb, it is expected to find wide use in all kinds of equipment which are exposed to weather. Typical applications include automotive trim, outdoor furniture, rain gutters, electrical fixtures and hardware.

As impact or die extrusions, and sheet metal, T-metal is available in any quantity, shape or length desired. It is said to be readily machined, spun or drawn—with self-lubricating qualities which increase die life as much as 25%. (Clean scrap is bought by Hydrometals at seven cents per lb.) The alloy is not recommended for die-casting.

T-metal contains a maximum of 0.2% titanium. This small "seasoning" increases the tensile strength

METALWORKING REPORT . . .

of the zinc 40% to 36,000 psi and decreases thermal expansion 40%. Also, it virtually eliminates the serious problems, with zinc, of grain growth and creep. Creep, under an 8000 lb load, that occurs in 1½ days in pure zinc takes from 500 to 8000 days in T-metal. Copper content of T-metal is less than 1%.

This alloy was patented by the New Jersey Zinc Co in 1951 and Hydrometals, Inc, obtained a license to produce it. Hydrometals has spent eight years in improving the process and now feels it is ready for commercial application.

MATERIALS HANDLING

New Pallet Standards

Eleven new pallet sizes, which replace several hundred currently in use in industry, have been announced by the American Standards Assn. Adoption by industry of these standard pallet sizes could lead to substantial savings: Pallets can be mass-produced, they are interchangeable (so that in many cases they don't have to be returned), and materials-handling can pre-plan loadings to get maximum utilization of truck and freight-car space.

Eight of the new sizes are rectangular, ranging from 24 x 32 in. to 48 x 72 in. The other three are square (36, 42, and 48 in.).

The first American Standard that touches on the fundamental design of materials-handling systems, the standard applies to all pallets, whether wood, metal, or paper. It is the first step in the establishment of a complete pallet standard that will include definitions, material usage, and evaluation and performance testing.

Copies of the new pallet standards (MH1.1-1959) are available from the ASA at $2 each.

MANUFACTURING CONTROL

The Team Approach

What manufacturing system will give the most economical production of several hundred precision instruments a day? A recently organized planning team at the A C Spark Plug plant of General Motors not only found the answer, but presented the plan in only twelve days.

To set up its study, the 16-man team (from departments that would participate in the project) studied every conceivable operation, from tooling to sales. It evaluated various layouts and charts, production processes — everything connected with the project. Planning boards were placed on the conference-room walls, and visual devices showed the team every operation as it was set up.

First target was to speed production of the company's Acilloscope, an instrument that observes performance and condition of automotive spark plugs. Success here has prompted the plant to analyze production operations on other products. Photographs and written descriptions of an operation are made, and from these the team can pick out and correct any flaws in the manufacturing process.

One big benefit of the new approach: the teamwork brings big savings by eliminating poor communication and duplication of effort.

Production-Data Collector

The production line and the front office are directly linked by Collectadata, a new data-collecting system developed by Friden, Inc, of San Leandro, Calif. Basically, the system consists of transmitting devices (which are located near work areas) that send information to a central receiver that accumulates data and transmits it to a computer or other analyzing device.

In operation, an input document card (tape, edge card, tab card, or form card) is coded by combinations of punched holes to designate order number, part number, and quantity. This form accompanies a production order through each step of the production process. As work is started or completed, a card or tape is inserted in a transmitter, which reads it automatically, then transmits it to the receiver in a central location, where the data is put onto a continuous punched tape. Once the tape is punched, it is ready for use on standard data-processing equipment.

Applications for the system include production reporting, manufacturing and inventory control.

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CINCINNATI

Better Machine Tools are the Cutting Edge to Economic Progress

Mr. Frederick V. Geier, Chairman of the Board, The Cincinnati Milling Machine Co., said in his address at the Company's 75th Anniversary Program ADVENTURES IN PROGRESS:

"In the international, economic, scientific and industrial areas the great issues of these times challenge the leadership of our statesmen and of our industries as well.

"At the core of today's crucial problems lie two axioms. Axiom number one – The United States dare not lag in the swift advance of science, technology and industry. Axiom number two – Excessive costs can put the monetary price of survival beyond our nation's reach.

"We at Cincinnati know full well that progress in machine tools is the very cutting edge of economic progress. On that economic progress our American way of life – indeed our very survival as a nation – may well develop.

"During the two centuries since John Wilkinson's boring machine successfully bored James Watts' steam engine cylinder, the basic machine tool types emerged. But within the present generation we have witnessed accelerated machine tool progress, which at Cincinnati alone has brought such new developments as the Centerless and Micro-Centric type grinders, the Hydro-Tel milling and die sinking machines, the cylinder block surface broach, the Spiropoint Drill Sharpener, the Intraform and Hydrospin metal forming machines.

"The art of cutting metal is old, but the productive use of power to swiftly cut and form metal to precise limits at low costs is as new as the motor car, the airplane and the guided missile.

"We have been hard at work to bring you new ideas, new methods, new machines – machines to make the labor of man more productive and more remunerative – machines to help you meet your own goals, in your responsibilities of creating and producing greater values in your products.

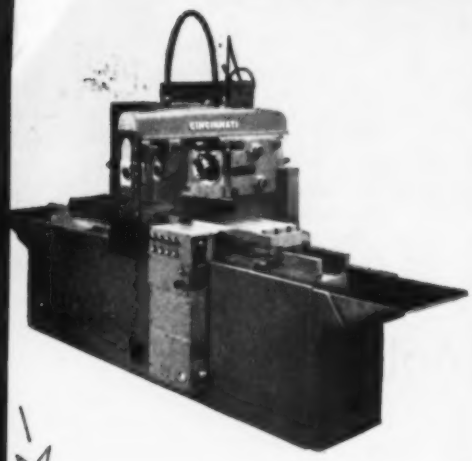
"You have seen new machine tool advances here today, you will see more in the years to come. The machine tool has not reached its full stature, it is still young. I am certain that we shall discover yet more effective ways to drive power through mechanisms and tools to produce work more precisely and at lower costs. And that is both a prediction and a pledge from us of Cincinnati."

° *How we have been working toward this goal is reflected in the following two-page display of some of the new Cincinnati developments presented during our* ADVENTURES IN PROGRESS.

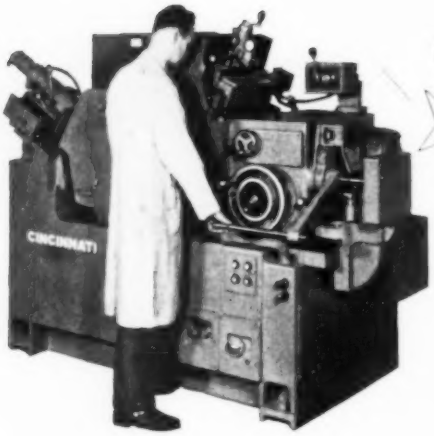
The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

These STARS of

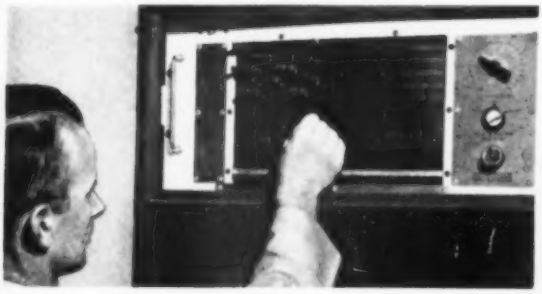
put new



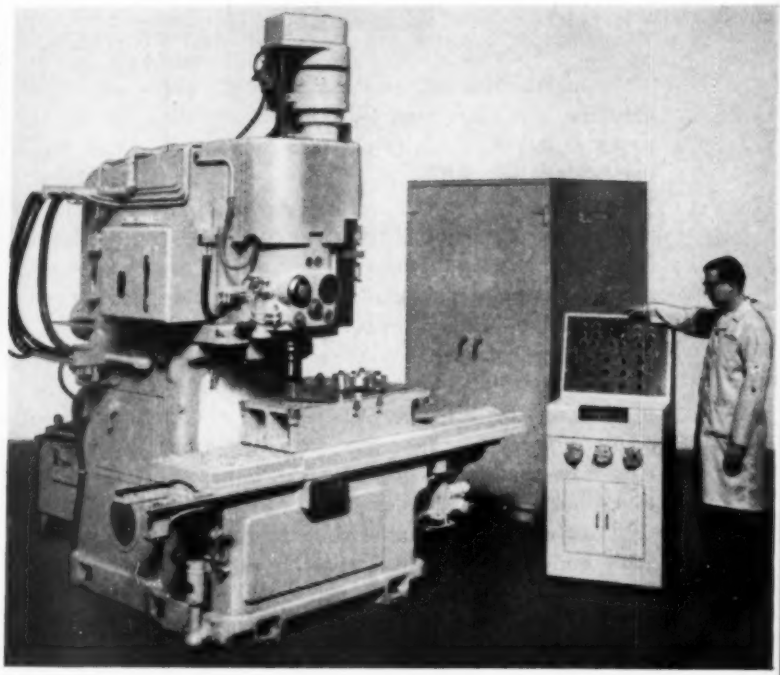
100 and 200 Series HyPowermatic Milling Machines have the flexibility for both small lots and high production runs. Two-direction table feed cycles and automatic spindle stop are standard feature-advantages. Built in plain and duplex styles with conventional table feed cycles, and automatic rise and fall and tracer controlled styles with Telematic selection of cycles.



Centuramic Centerless Grinders raise quality standards and broaden the range of the centerless method. The 210-6 is the "Handy Andy" size for job shops, while the 340-20 size at the other extreme introduces a new extra low-cost concept . . . thrufeed grinding with 20" wide wheels.



Telematic Control is a simple pegboard selection of table and spindle carrier automatic cycles. Auxiliary operations such as fixture clamping may also be plugged in. Applicable to 100 and 200 Series Rise and Fall and Tracer Controlled HyPowermatic Milling Machines.



Cincinnati Acramatic Numerical Control offers the unique advantage of unified machine and control design and responsibility. Its field covers simple two-axis positioning for drilling, to complex three dimensional contour milling. The above 16" Vertical Hydro-Tel Milling Machine shows a three dimensional setup.

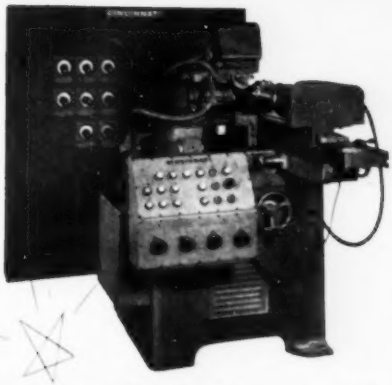
CINCINNATI

BUILDERS OF FINE MACHINE TOOLS: MILLING • GRINDING • BROACHING • ELECTRICAL DISCHARGE MACHINING • DIE SINKING • CUTTER AND TOOL GRINDING • PRODUCTION LINES • METAL FORMING • • HARDENING MACHINES

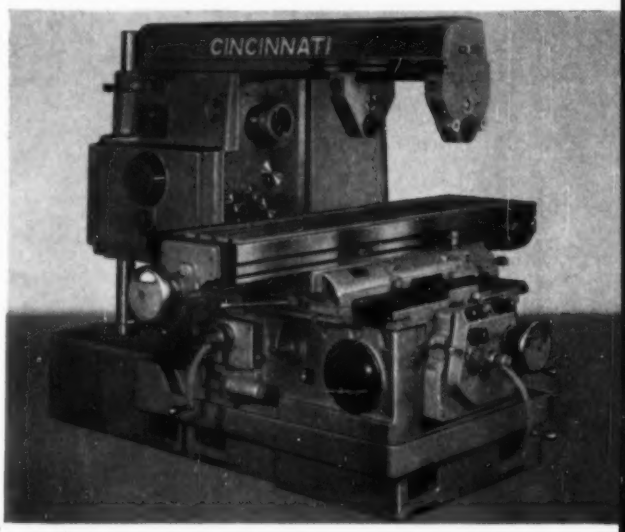
Adventures in PROGRESS

life in cost-cutting programs

ADVENTURES IN PROGRESS marked Cincinnati Milling's 75th year of serving the metalworking industry. The event starred many all-new machine tools. These machines represent something more than new equipment, they represent the Mill's philosophy of always striving to build better machines to help you create greater values in your products. Information on the stars of ADVENTURES IN PROGRESS may be obtained by writing to **The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

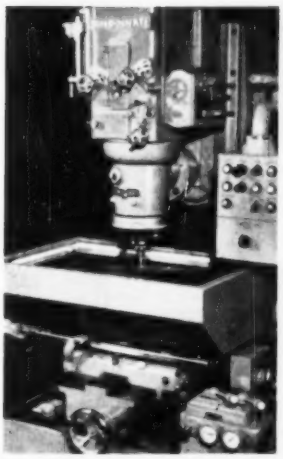


Automatic Cutter Grinder initiates a brand-new approach to cost prevention . . . the automatic precision sharpening of cutting tools. Cutter manufacturers and high volume users of plain and stagger tooth cutters will welcome this machine.



All-Purpose Milling Machine combines flexibility of knee-and-column types with productivity of bed types. Fixed height table facilitates work handling. Wide range of speeds and feeds are selected by power with a single lever.

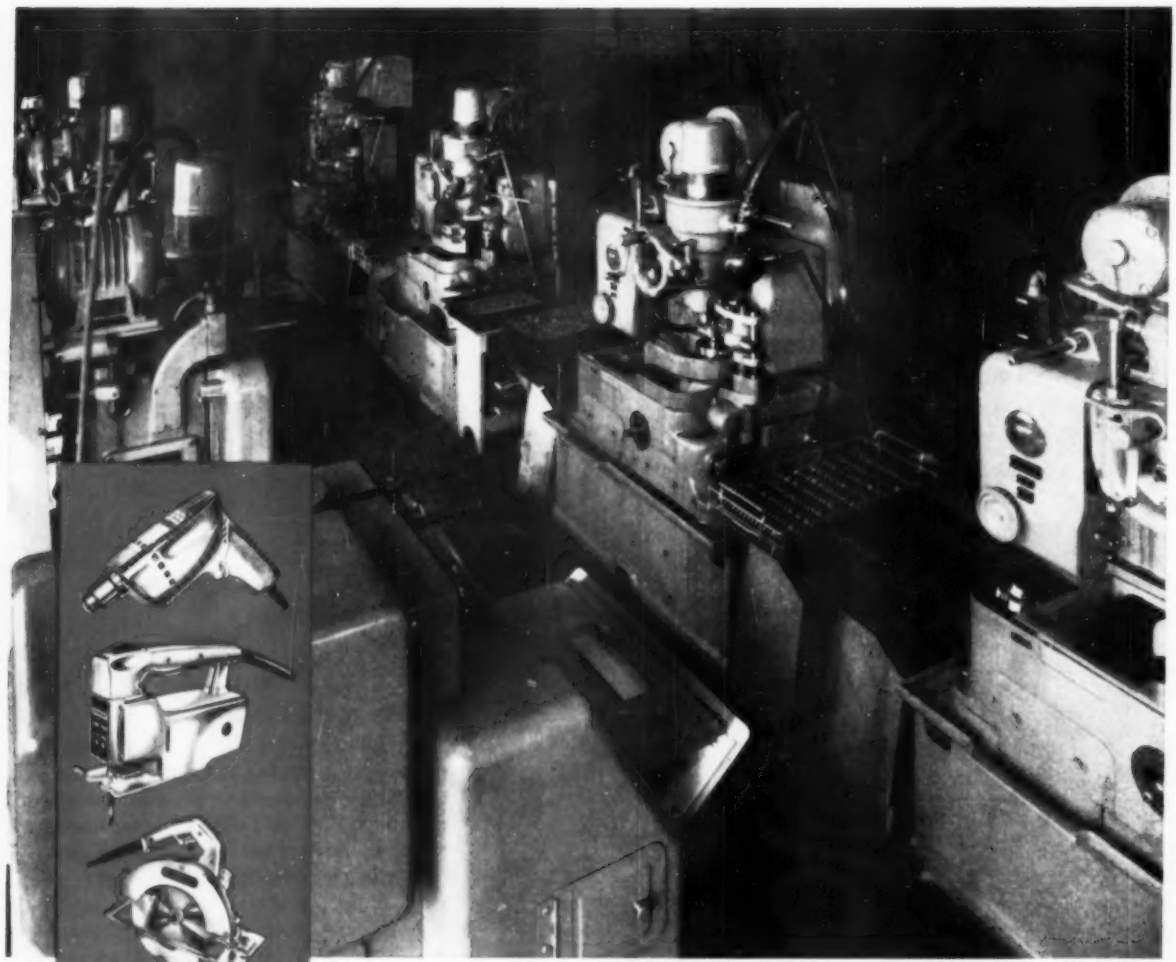
Super Precision 4" Plain Grinder puts accuracy requirements of 25 millionths on a production basis. Cincinnati's Grind-a-Mate gaging system automatically sizes the part to a ring gage or mating member.



Elektrojet Electrical Discharge Machines embody the machine tool builder's approach to this highly significant method of removing metal. Give you 35 choices of equipment, covering the requirements for unusual or "impossible" machining operations on a wide variety of parts ranging from small missile components to forging dies.

CINCINNATI®

FELLOWS GEAR PRODUCTION Builds Extra Quality



View of production floor at Stanley Electric Tools, showing some of the Fellows Gear Production Equipment used.

Gears produced with Fellows Machines add high quality to these Stanley Electric Tools.

THE PRECISION LINE

Fellows

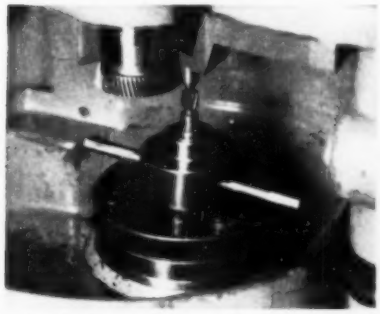
EQUIPMENT at Lower Cost for STANLEY

Stanley is a name you know . . . a name that stands for high quality in electric tools.

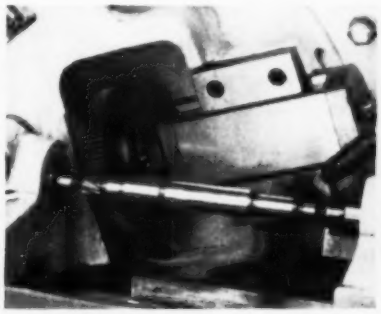
To insure this quality, while providing the high production rates that mean lower costs, Stanley Electric Tools, Division of The Stanley Works at New Britain, Conn., uses Fellows Gear Production Equipment for shaping, shaving and inspecting the armature pinions for its electric tools.

Fellows has long been the leader in Gear Production Equipment, with machines for every gear production job: Fellows Gear Shapers, Pfauter Gear Hobbers, Fellows-Reishauer Gear Grinding Machines, Fellows Gear Shaving Machines and Fellows Inspection Instruments.

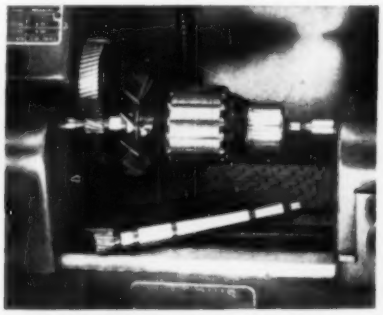
If you make gears of any size, from 1/16″ P.D. to 120″ P.D., Fellows' 60 years of experience can help you improve quality and cut costs. For complete information on Fellows Gear Production Equipment, call your nearest Fellows office.



SHAPING. The versatile No. 7125 Fellows Gear Shaper gives Stanley high production speeds (up to 450 strokes per minute). It also provides fast, simple changeover from one job to another.



SHAVING. The No. 4 Fellows Fine Pitch Shaving Machine puts finishing touches on each pinion and adds the finish which results in long life and quiet operation.

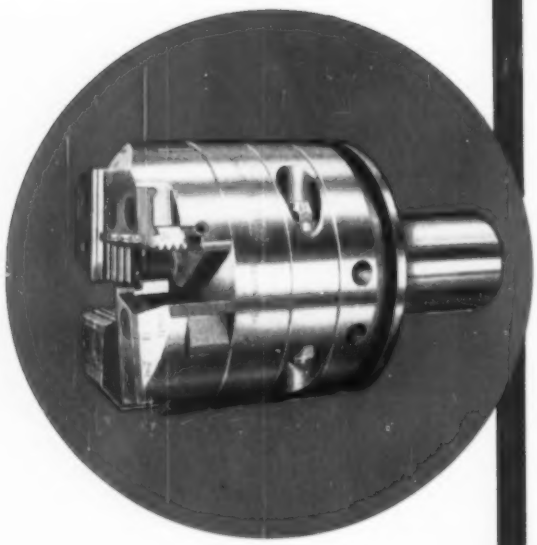


INSPECTING. The No. 4 Fellows Fine Pitch Red Liner makes and records a composite check of gear accuracy, insuring high quality standards.

Gear Production Equipment

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices:
319 Fisher Building, Detroit 2
150 West Pleasant Avenue, Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Avenue, Los Angeles 45

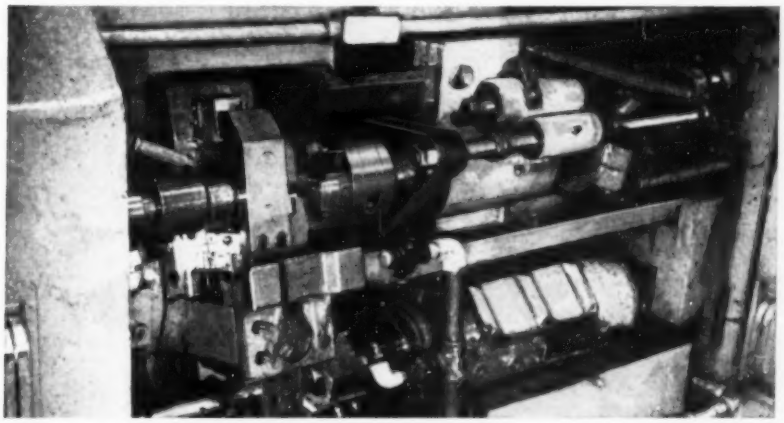
LOW TOOL COST AT GRABLER MANUFACTURING CO.



LANDEX HEAD THREADS 6000 PIECES BETWEEN GRINDS

Dollars in production time and tool cost are saved by using a LANDIS LANDEX Heat-Treated Revolving Die Head at the Grabler Manufacturing Co., Cleveland, Ohio.

1¼" 12 pitch "V" form threads were cut on malleable iron union bodies by this LANDEX Head mounted on a New Britain Automatic in the left-hand third position (see illustration). 10 hours of continuous operation produced 6000 pieces before the chasers required regrinding.



The LANDEX Head, for application to bar automatics and other "live" spindle machines, has ample head rigidity allowing long life and high quality thread production. They offer low initial cost, permit rapid set-up, give trouble-free operation, and are easy to adjust. The outstanding tool life is the result of basic chaser design and over 50 years of LANDIS research and experience in manufacturing and hardening. For example, to ensure satisfactory die life, chasers are given special hardening when work piece design or material specifications so indicate. LANDEX Heat-Treated JN Heads are available in four sizes for threading all diameters from #4 to 2". All can be equipped with oversize chaser holders for threading above their standard range.

For detailed information see your nearest LANDIS representative or write directly for Bulletin F-90.

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

the world's largest manufacturer of threading equipment

Threading Machines

Die Heads—Rotary & Stationary

Taps—Collapsible & Solid Adjustable

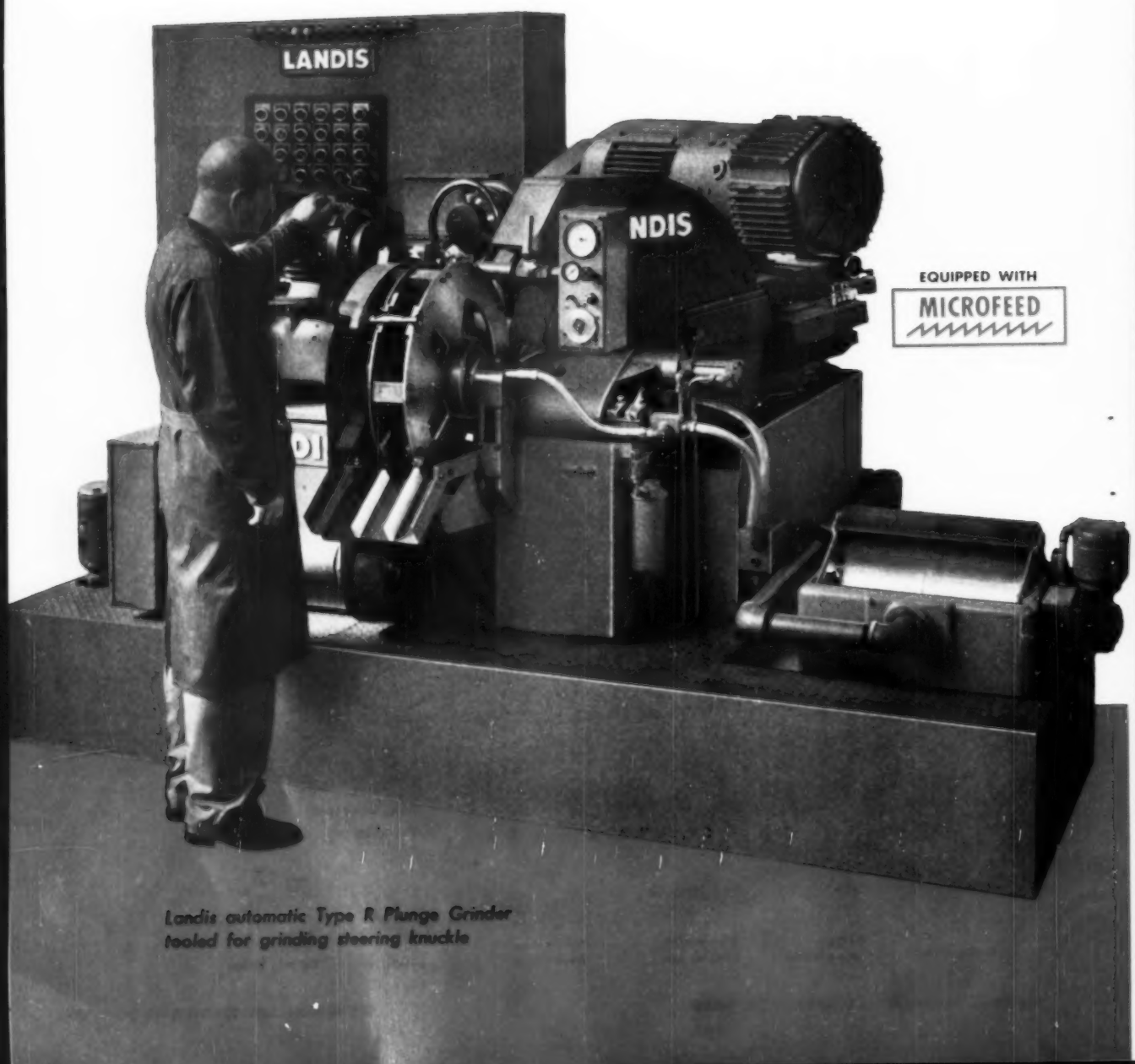
Centerless Thread Grinding Machines

Thread Rolling Tools

Thread Rolling Machines

Now...grind with *predictable*

New Landis automatic plunge grinder gives



Landis automatic Type R Plunge Grinder tooled for grinding steering knuckle

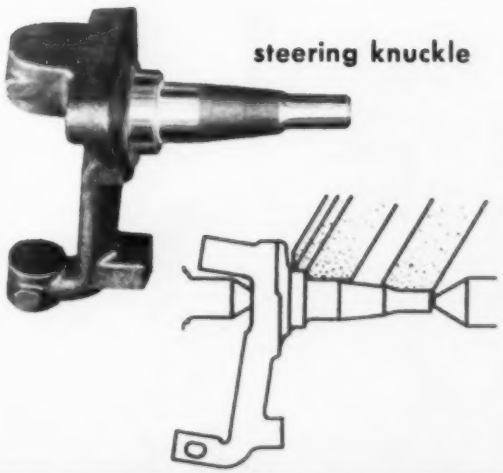
precision and production

consistent accuracy and higher output

Field reports of actual production figures

57% savings in cost per piece over former method

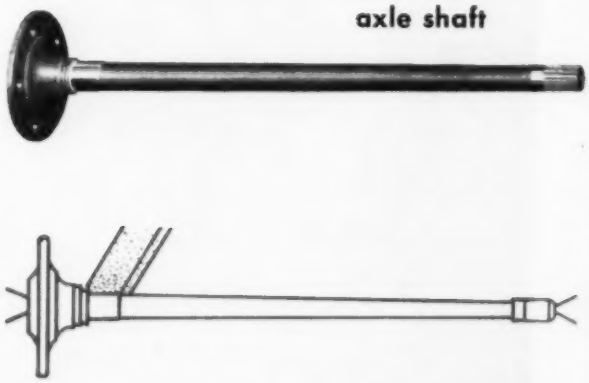
Part . . . . . steering knuckle
Net production . . . . . 210 parts per hour for 2 machines—1 operator
Operation . . . . grinding two diameters, radii and face surface at one time
Machine . . . . . Landis R Plunge Grinders
Material . . . . . 5147 nickel steel forging
Hardness . . . . . 34-38 Brinell
Stock removal . . . . . .015" - .018"
Finish . . . . . Commercial
Specified tolerances . . . size . . . . . .0006"
roundness . .0002"
straightness .0002"



steering knuckle

cost per piece cut 58% from former methods

Part . . . . . axle shaft
Net production . . . . . 240 parts per hour for 2 machines—1 operator
Operation . . grinding two bearings, adjacent face and radius at one time
Machine . . . . . two Landis R Plunge Grinders, one operator
Material . . . . . 5147 nickel steel forging
Hardness . . . . . Rockwell 50-52
Stock removal . . . . . .015" - .020"
Finish . . . . . Commercial
Specified tolerances . . . size . . . . . .0006"
roundness . .0002"
straightness .0002"



axle shaft

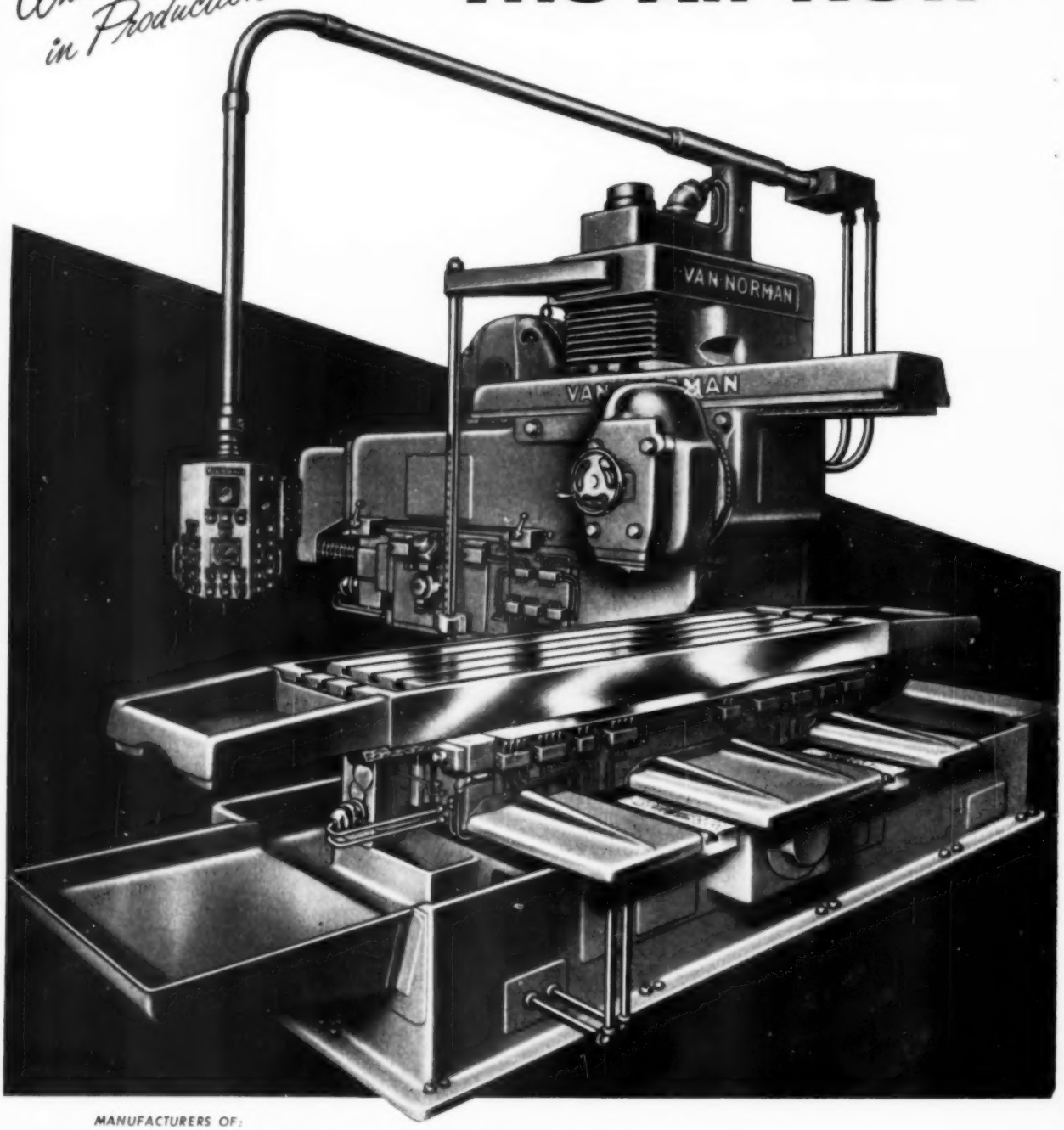
LANDIS

precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

What's New Newest in Production Millers?

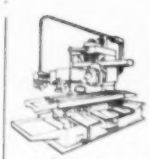
The All-New

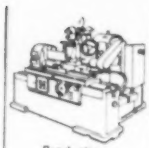


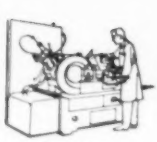
MANUFACTURERS OF:

Milling Machines

Standard Cylindrical Grinders


Bed-type Mills


Production Grinders


Centerless Grinders

VAN NORMAN

SPRINGFIELD 7, MASSACHUSETTS

Van Norman 746

VERSI-MATIC

- **Designed and built for modern production**
- **Engineered for numerical control**
- **Offers maximum rigidity — accuracy — versatility — range — horsepower**
- **An 18-ton precision-built bed-type miller**
- **Also available without saddle**

Here it is — the newest thing in production millers — just the machine to cut or shape all of the new, tough super alloys while still maintaining exacting tolerances. *And* the 746 retains all the famous Van Norman quality features including the exclusive Van Norman 4-way cutterhead.

Examine closely the detailed specs of this newest Van Norman production miller. Then contact your nearest Van Norman dealer or write directly to Springfield.

We'll be glad to show you how the 746 Versi-Matic can fit into *your* production line.

SPECIFICATIONS

NO. 746 VERSI-MATIC VAN NORMAN SADDLE BED TYPE MILLING MACHINE
NO. 796 VAN NORMAN BED TYPE MILLING MACHINES

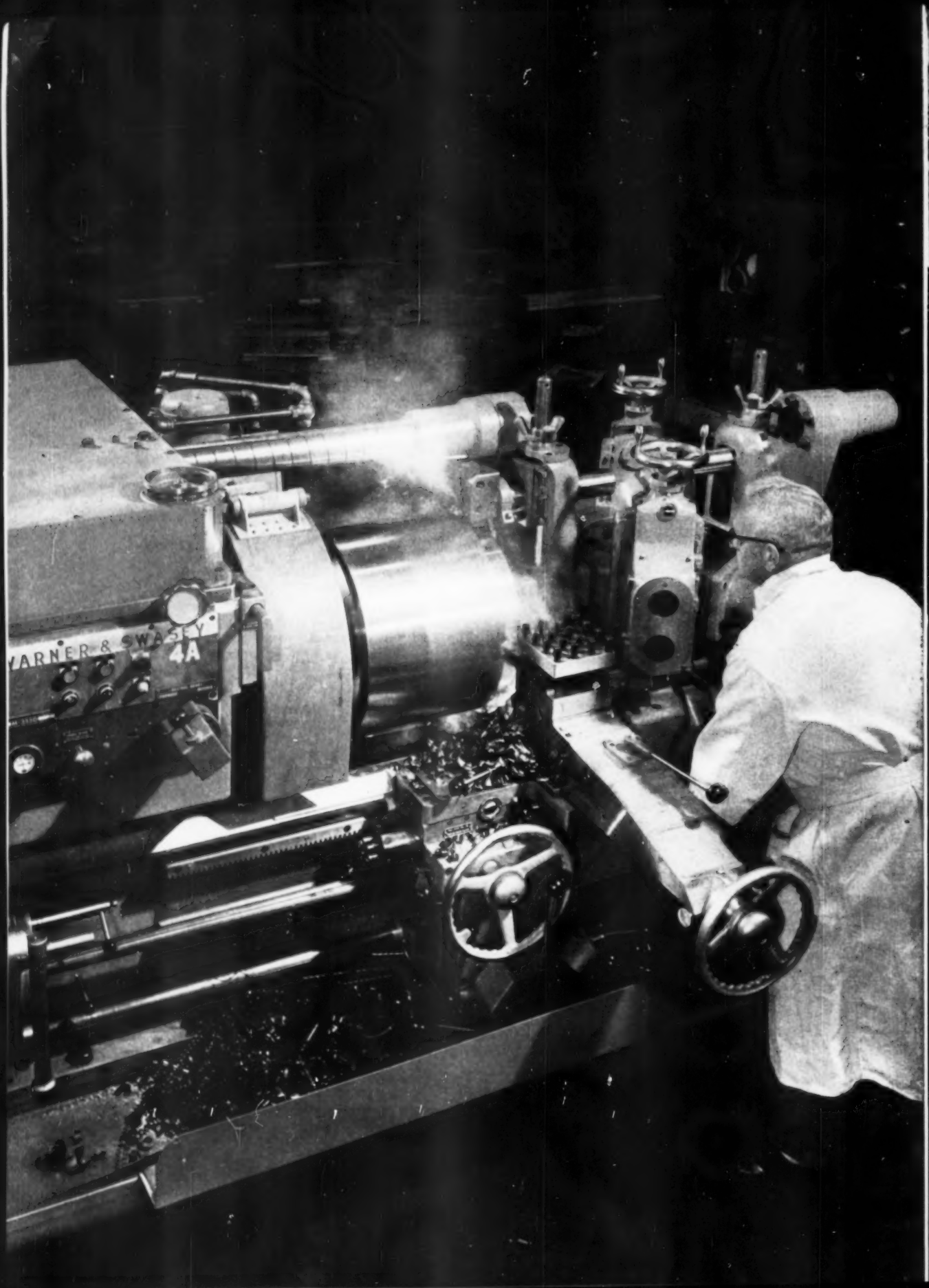
		746 with Saddle	A.I.A.* Med. Size	796 without Saddle
TABLE SIZE	Length	96"	94"	108" also 130"
	Width	24"	20"	30"
	T-Slots (3)	1 1/16"	1 1/16"	1 1/16"
POWER FEED TRAVEL	Longitudinal	50"	50"	72" also 108"
	Transverse (Saddle)	14"	14"	–
	Transverse (Ram)	44"	–	44"
	Vertical	35"	20"	48"
CLEARANCE MAX.	Spindle to Table (Horiz.)	35"	20"	48"
	Spindle to Table (Vert.)	22"	–	35"
	Cutter Dia.	16"	16"	16"
POWER FEEDS IPM	Longitudinal (Table)	1/2-90	1/2-90	1/2-90
	Transverse (Saddle)	1/2-90	1/2-90	1/2-90
	Transverse (Ram)	1/16-45	–	1/16-45
	Vertical	1/16-45	1/16-45	1/16-45
	No. Steps	Inf.	32	Inf.
	Rapid Traverse (Table & Saddle)	150	150	150 (table only)
	Rapid Traverse (Vert. & Ram)	75	–	75
SPINDLE	Horsepower	25 50	25 50	25 50
	R.P.M.	15-1500	15-1500	15-1500
	No. Steps	18	16	18
	Head Swivels	120° (30° by vert.)	–	120° (30° by vert.)
	Taper	ASA 50	ASA 50	ASA 50
	Flange	ASA 60	ASA 60	ASA 60
WEIGHT	Net approximately	37,000 lbs.	–	41,000 lbs.

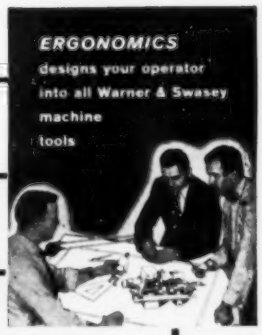
*Aircraft Industries Association NAS-909 Specifications.

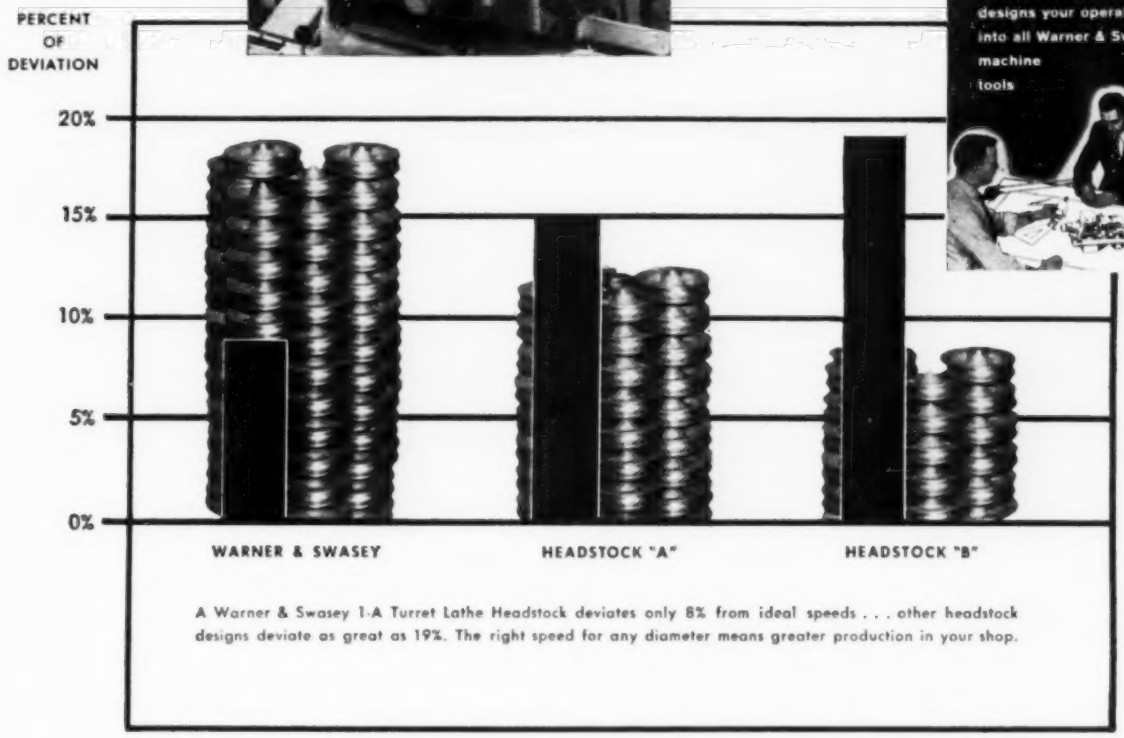
MACHINE COMPANY

A DIVISION OF VAN NORMAN INDUSTRIES, INCORPORATED

Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years. Conditional Sales Contracts not available to Export.


WARNER & SWASEY
4A





A Warner & Swasey 1-A Turret Lathe Headstock deviates only 8% from ideal speeds . . . other headstock designs deviate as great as 19%. The right speed for any diameter means greater production in your shop.

Warner & Swasey hydraulic **HEADSTOCKS**

provide operators better choice of proper cutting speeds

Warner & Swasey's new, more powerful hydraulically-controlled headstocks are being hailed by turret lathe operators everywhere. They like the greater range of preselected cutting speeds — instantly available by a touch of the hand. (With a two-speed motor, they can now get twice as many *unduplicated* speeds.) Control is so easy and effective — one master lever shifts gears and handles spindle stops, starts and reverses.

Operators can easily choose in advance the most effective speed for each cut from Warner & Swasey's exclusive direct-reading Preselector. When required, it's effortlessly picked up merely by pressing the control lever. No wonder they prefer to operate Warner & Swaseys.

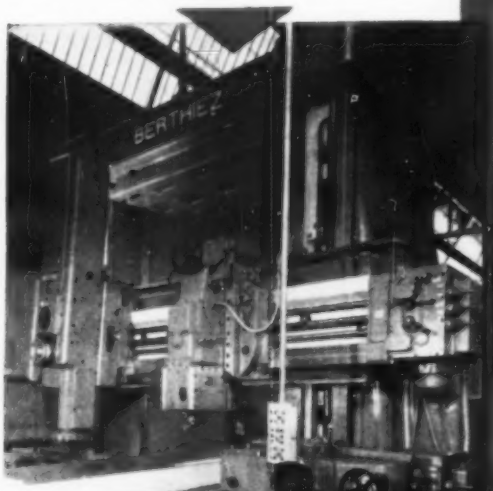
On Warner & Swasey's No. 4 and No. 5 Ram Type and 1-A Saddle Type Turret Lathes, direct-acting, self-adjusting hydraulic clutches with a constant mesh gear train instantaneously make the preselected speed change at the touch of a lever. Our larger Saddle Type (2-A, 3-A and 4-A) headstocks employ hydraulic pistons to shift gears after the gear train has been automatically slowed to shifting speed.

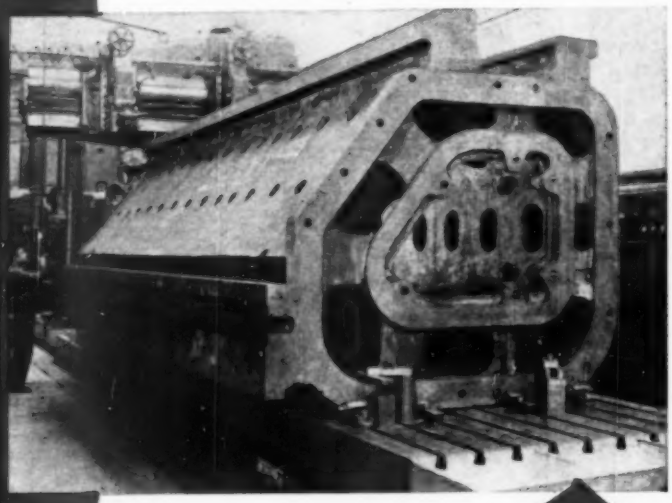
WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

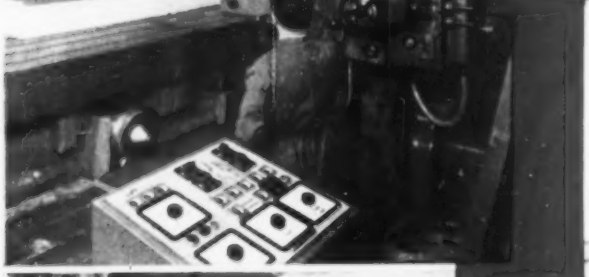
BERTHIEZ

Double Upright Planing
and Milling Machine type R F 2 - 200

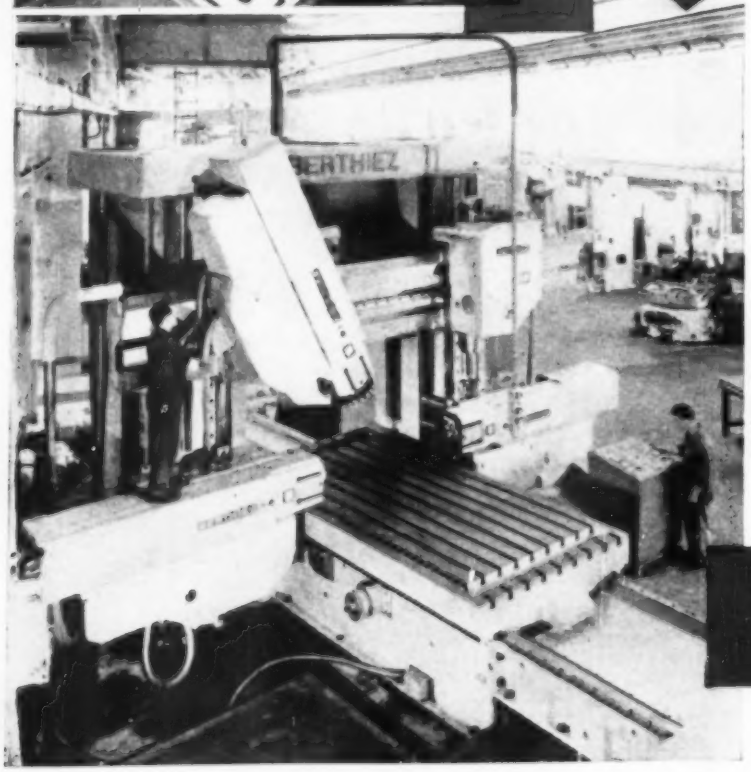




Single Upright Planing Machine
type 9120

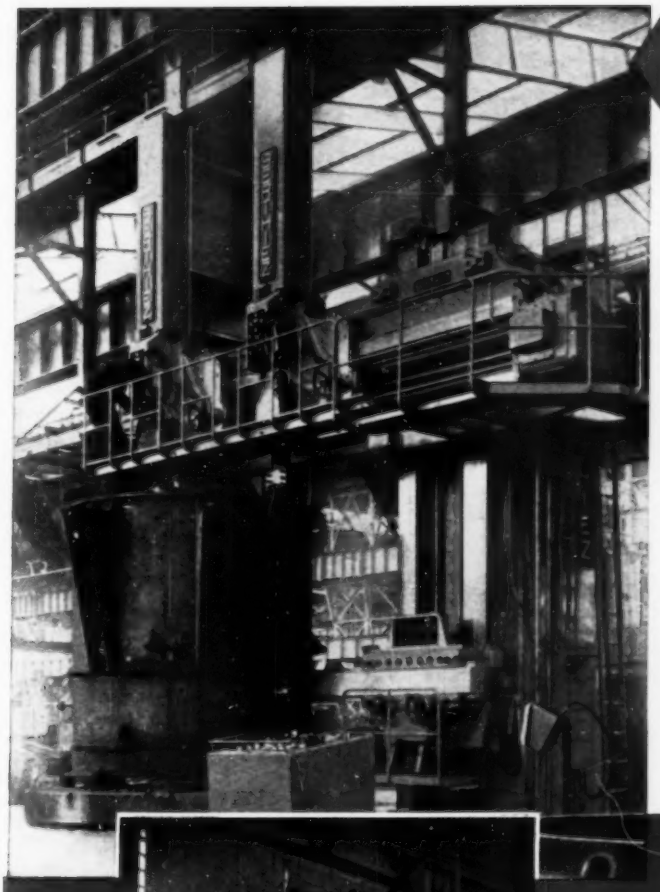


Double Upright Plano Milling Machine
type F 2 - 200



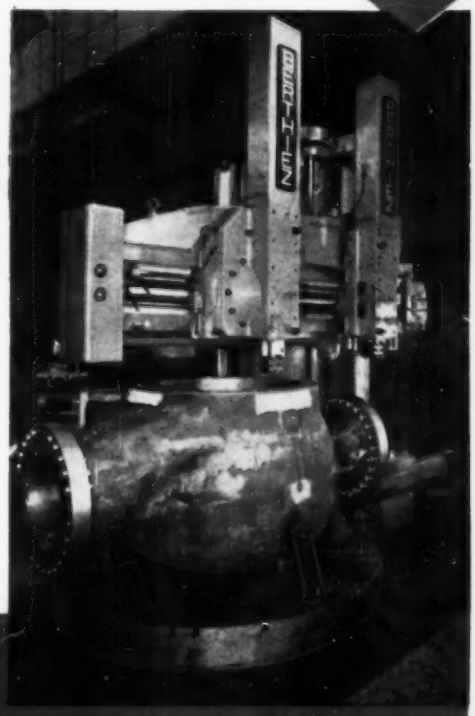
All *BERTHIEZ*
Planing Machines
plane both ways i. e.
cut coming and going

529



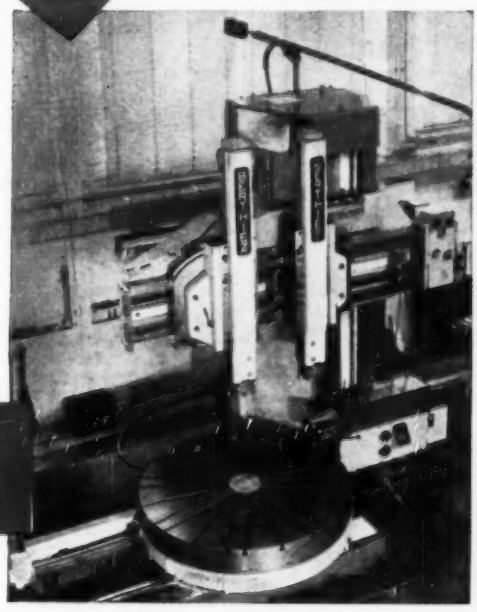
Vertical Boring and Turning Mill
type 9375

Vertical Boring and Turning Mill
type 9135



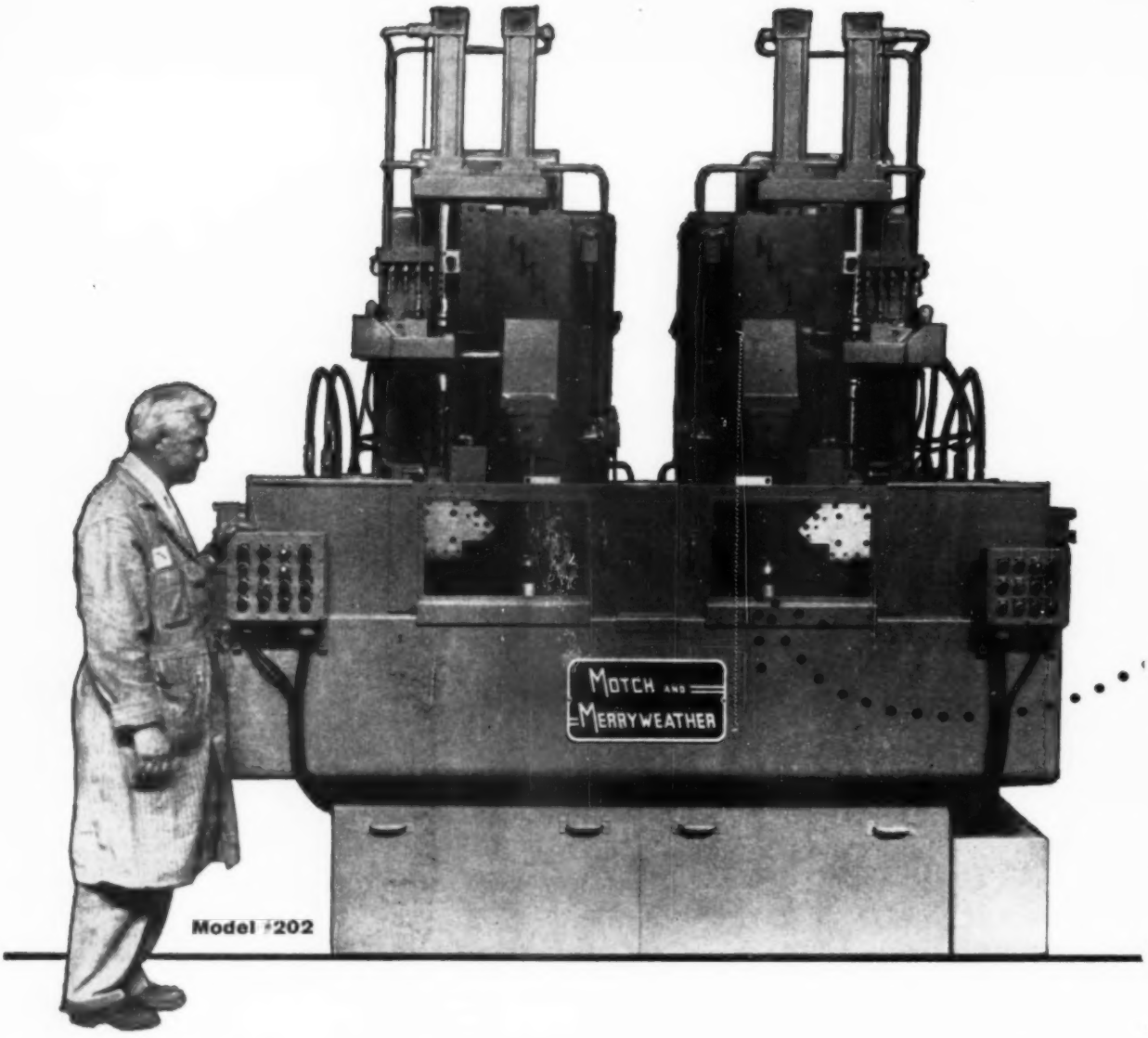
Vertical Boring
and Turning Mill type BML 180

Vertical Boring and Turning Mill
type BM 225



BERTHIEZ

11, RUE MONTALIVET - PARIS 8e - TÉL. ANJ 47-60



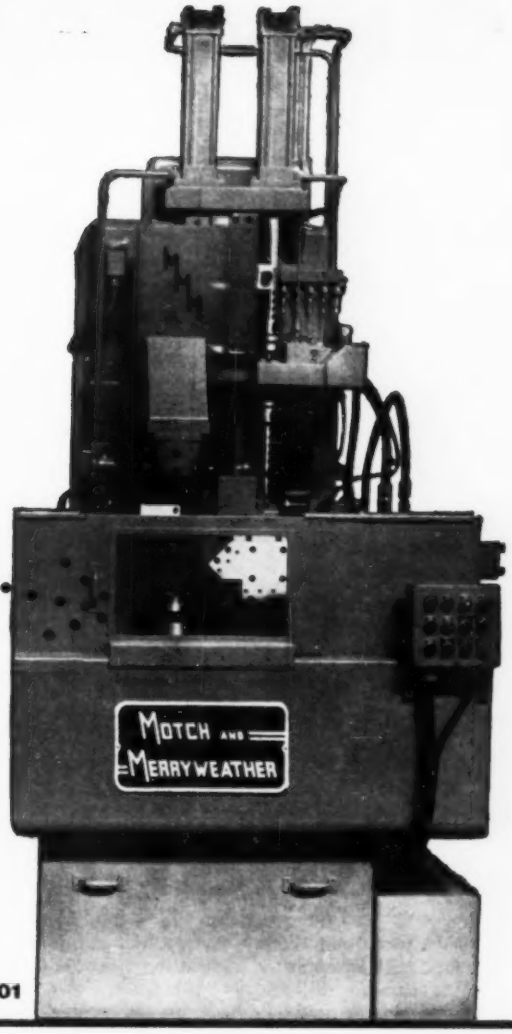
MOTCH & MERRYWEATHER'S

...add flexibility to standard machining operations

Here's a machine tool designed for precision turning, boring and facing operations with versatility for long and short run production jobs. Features:

- **spindles will accommodate any type chuck including air operated draw bar (20" swing) —spindle speeds adjustable.**
- **automatically-lubricated tool slides.**
- **slide ways of hardened and ground steel with tapered gibs for accurate alignment and easy adjustment.**
- **hardened adjustable slide stops.**
- **hydraulic or cam-actuated slide-feed, rapid traverse and rapid return.**

Boring, facing, and turning—to 20"—is accurately handled on the new M&M Series #200 Vertical Turners.



Model #201

#200 VERTICAL TURNERS

- separate controls for each spindle and slide unit to permit their independent operation on two-spindle machine (single spindle machines available).
- on four-spindle, two column machine, spindles are controlled in pairs, separate controls for each pair.
- "building block" design for easily-made tooling and slide changes to accommodate a wide variety of work.
- design features accessibility for simple, speedy maintenance of spindles, motors, hydraulic cylinders and/or cams and slides for minimum downtime.
- three position automatic turret available for boring, counter-boring, etc.

We can show you, in detail, how this new adaptable metal-working machine will improve your present machining operations. Call your nearby Motch & Merryweather representative, or write: Motch & Merryweather Machinery Company, 1250 East 222nd Street, Cleveland 17, Ohio.

MOTCH AND MERRYWEATHER

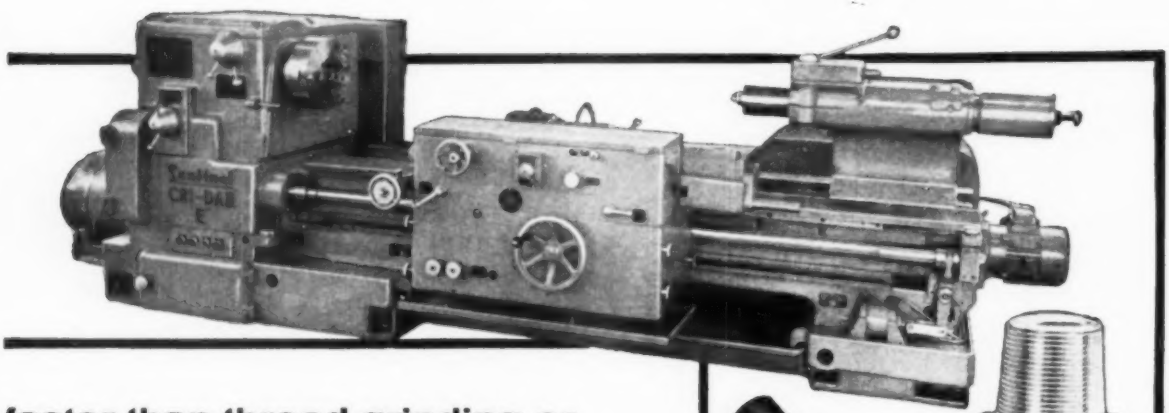
Machine Tool Manufacturing Division
Cutting Tool Manufacturing Division
CLEVELAND
Avey Division, Cincinnati

BUILDERS OF AUTOMATIC PRECISION CUT-OFF, MILLING, DRILLING AND SPECIAL MACHINERY

CRI-DAN

(Semi-Automatic Single Point)

THREADING LATHES...



faster than thread grinding or milling...handles toughest jobs on hardest materials at less cost--

distributed by

GISHOLT

Widely used throughout Europe and rapidly gaining favor in the U.S.A., CRI-DAN High-Speed Threading Lathes offer outstanding advantages on a wide variety of threading work. Using single-point carbide tools and positive, cam-controlled movements, CRI-DAN provides very accurate lead and thread form on all types of internal and external threads, including multiple-start, coarse, fine, left- or right-hand, parallel or taper, with metric or inch pitches. Highest production, accuracy and fine finish are assured on even the most difficult materials.

With simple operation and 15 minute change-over, CRI-DAN is an extremely versatile machine capable of handling an amazing range of components at high production rates. Single-point carbide tools, easily resharpened or replaced, cut tooling costs to a minimum.

Two models are available with a full complement of accessories to meet your needs. Ask your Gisholt Representative for full details or write

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers
Threading Lathes

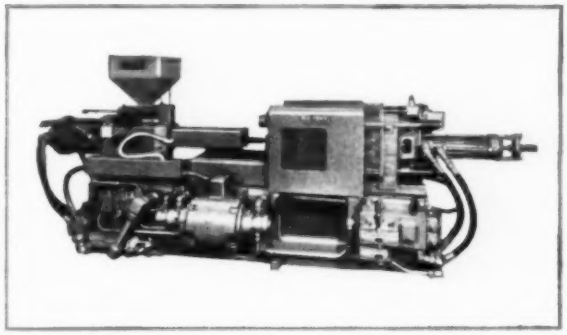
NOW! Let General Electric ECONO-MATCH Motors to Meet Your Specific Drive Requirements

You have over *three billion* different designs and types of integral hp a-c motors to choose from. And, it is increasingly difficult and costly to make this choice. It will pay you to find out how General Electric engineers can help you do this motor selection job.

THIS NEW MOTOR SELECTION SERVICE, ECONO-MATCHING, is the optimum matching of motor to machine and application for over-all economy, improved machine performance and greater reliability.

HOW ECONO-MATCHING WORKS—G-E engineers work closely with your designers studying machine characteristics: speed, torque, duty cycle, life expectancy, environmental conditions, etc. Then, through use of computers and advanced design techniques, General Electric can supply exactly the motor required for your job.

FOR EXAMPLE, the Reed-Prentice injection molding machine, shown at right, had been using a standard 40-hp motor. By ECONO-MATCHING, G-E engineers determined that a smaller, lighter, more compact 30-hp motor with improved electrical characteristics could do the job required. Although this special 30-hp motor cost slightly more than a standard 30-hp, it provided greater efficiency and cost considerably less than the 40-hp motor it replaced. It also cut space and weight requirements. G.E. has also ECONO-MATCHED motors for crane, compressor, and other applications.



GENERAL ELECTRIC

MAIL THE ATTACHED COUPON TODAY . . .

or call your nearby General Electric Apparatus Sales Office for complete information on how G-E can ECONO-MATCH a motor to meet your specific requirements.

Section L891-21A
GENERAL ELECTRIC CO.
Schenectady, N. Y.

Please furnish more information on how you can ECONO-MATCH a motor for my application which is _____

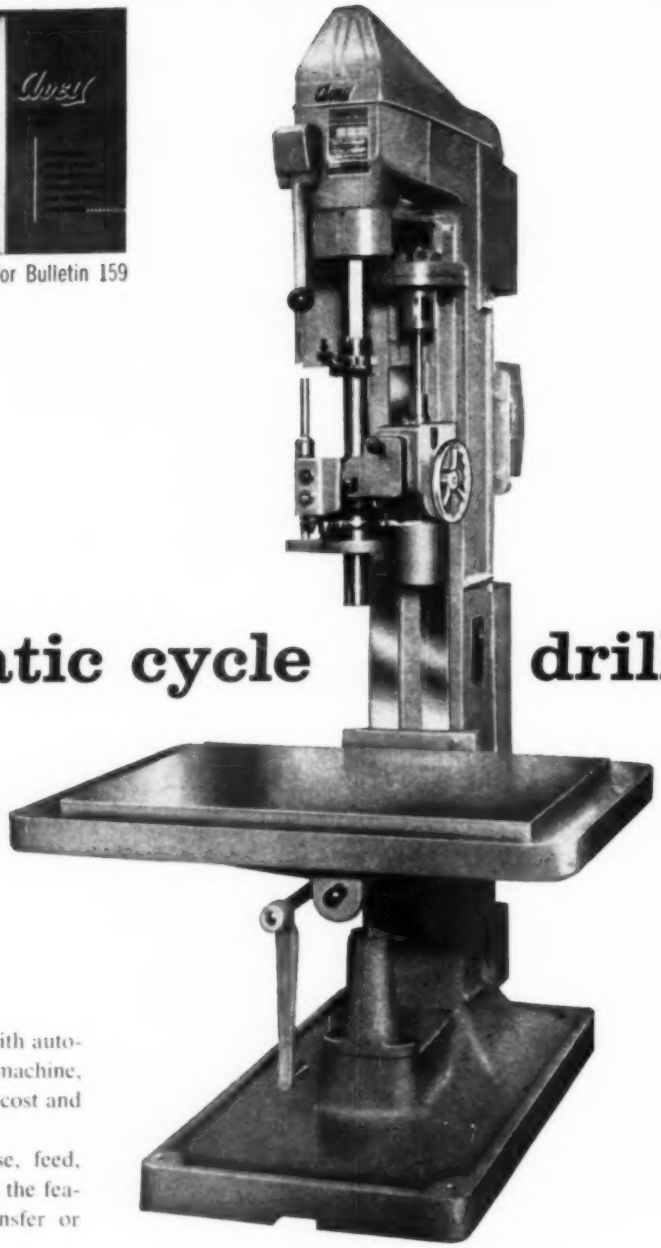
NAME _____ TITLE _____

COMPANY _____

CITY, STATE _____

CIRCLE 172 READER SERVICE CARD

Write for Bulletin 159



automatic cycle drilling

■ You can chop your time costs with automatic set-ups on this new Avey machine, and still take advantage of the low cost and flexibility of a standard unit.

Adjustable rapid power traverse, feed, and rapid return of the spindle are the features which permit automatic transfer or rotary index fixturing.

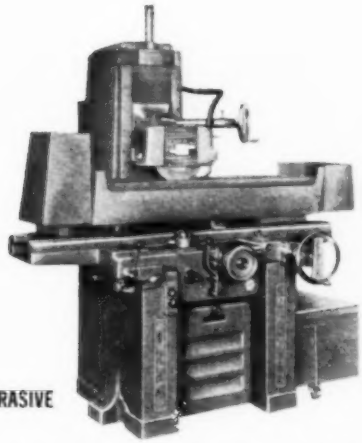
At the same time, you get adjustable feeds, speeds, table travel, head travel, and Avey's advanced spindle construction.

The machine is available with No. 2, 3, and 4 Morse Taper; 1 to 3 HP motors; single or multiple spindles. Your request for additional information will be promptly answered. Avey Division, The Motch & Merryweather Machinery Co., P. O. Box 1264, Cincinnati 1, Ohio.

Avey

the ABRASIVE line

of precision surface grinders
first for accuracy... first for value

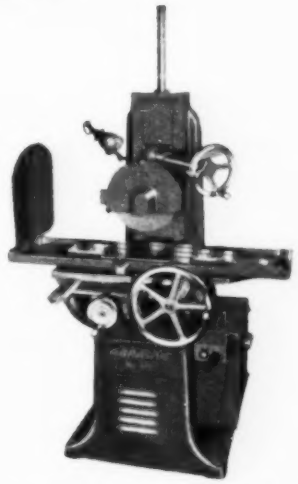


HYDRABRASIVE

The modern line of hydraulically operated surface grinders for general machine shops, production operations and tool shops. Four sizes with 12" wheel and 3 hp motor.

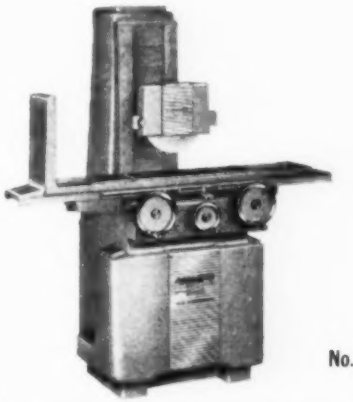
No. M3 and 3B

For production and toolroom jobs where a fast, accurate surface grinder is needed with power table traverse and cross feed. M3 has 2 hp motorized spindle. 3B has 3 hp main drive with belt to spindle. Both 8" x 24" x 12" capacity with 10" wheel.



No. 1½

This is probably the most popular machine for tool and die work. Hand operated with a 12" wheel for deep slot grinding. 1 hp motor and 10" x 15" x 12" size.



No. 618

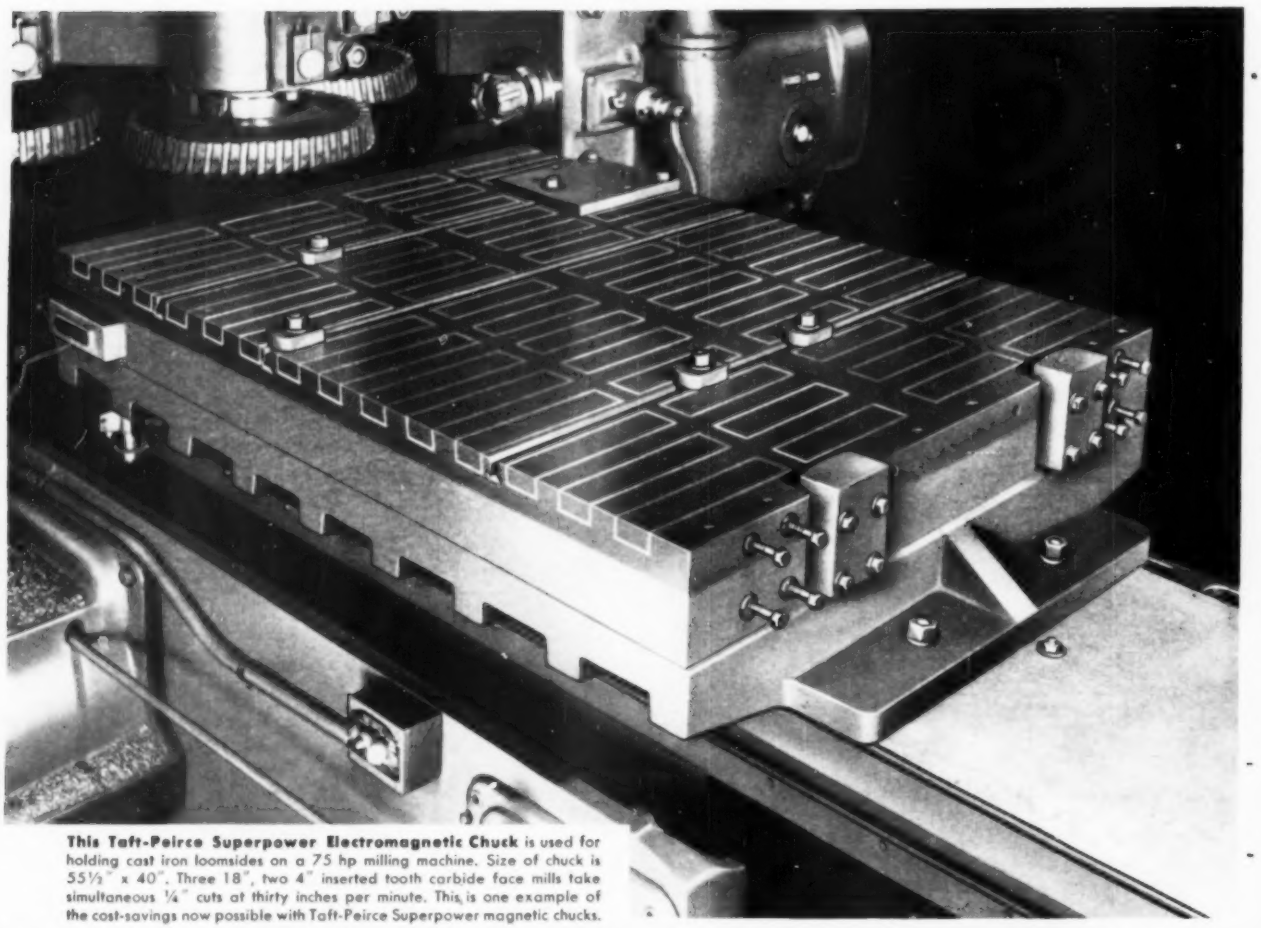
One of the newest and most modern machines of its size for easy hand operation and dependable precision results. It's available with either a 7" wheel and 1 hp motor, or a 12" wheel with 2 hp motor.

ABRASIVE
precision surface grinders

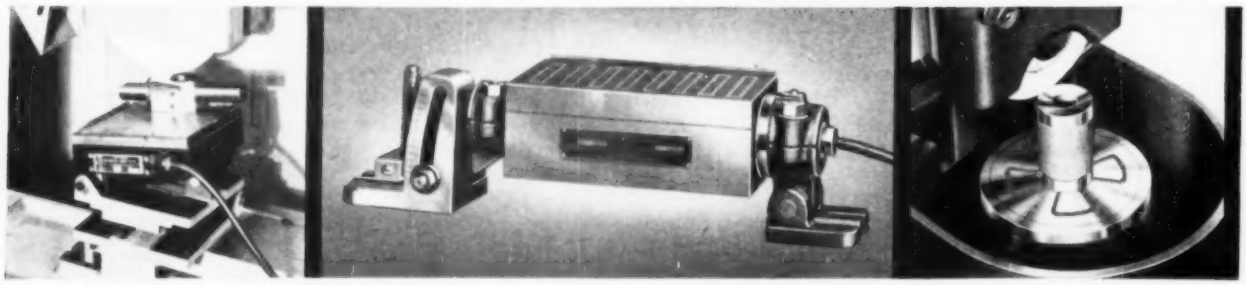
a product of
LANDIS TOOL
world's largest manufacturer of
precision grinding machinery
WAYNESBORO, PENNSYLVANIA

FROM THE TAFT-PEIRCE METALWORKING FAMILY . . .

Magnetics Bring Lower Costs,



This Taft-Peirce Superpower Electromagnetic Chuck is used for holding cast iron loomsides on a 75 hp milling machine. Size of chuck is 55½" x 40". Three 18", two 4" inserted tooth carbide face mills take simultaneous ¼" cuts at thirty inches per minute. This is one example of the cost-savings now possible with Taft-Peirce Superpower magnetic chucks.



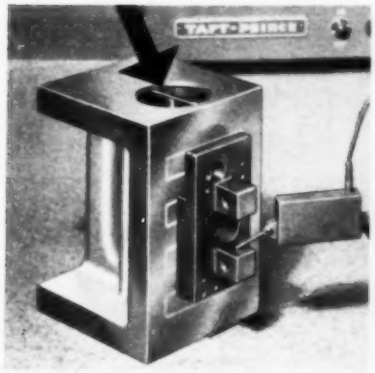
Taft-Peirce Superpower Sine Angle Magnetic Chucks eliminate bolts and clamps in positioning tricky angle grinding jobs. Angles can be quickly set using gage blocks. Available in simple or compound angle models. **Taft-Peirce Superpower Precision Duplex Adjustable Chuck** is an indispensable time saver in grinding and machining formed tools, simple or compound angle work and tool dressing. A precision fixture, magnetic surface can be swiveled 180° and tilted 14°. **Rotary Superpower Chucks** are ideal for use on vertical grinders and in place of face plates on lathes. Superpower design provides extra power in compact space.

Simplicity to Workholding

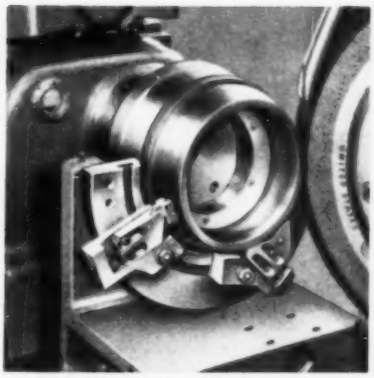
Taft-Peirce Superpower magnetic chucks and devices provide many new opportunities to streamline workholding for both machining and inspection. Mechanical clamping and complicated set-up arrangements are eliminated and costly set-up time is greatly reduced. The Superpower design provides extra magnetic strength with engineered flux concentration — resulting in greater magnetic working surface and more set-up versatility. The simplicity and flexibility of Taft-Peirce magnetic devices make them ideal not only for grinding, but for general workholding in milling, shaping, profiling, layout, and inspection.

Taft-Peirce offers the most complete line of magnetic chucks, work drivers, and holding devices available today. Standard units can be easily adapted in the plant to handle a wide variety of work, or Taft-Peirce can develop magnetic devices for specialized workholding jobs.

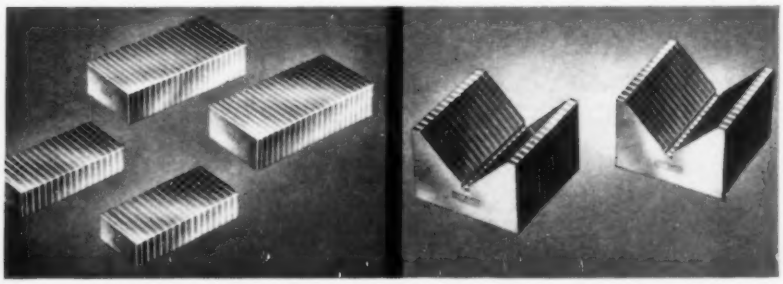
Send for Catalog No. 412 . . . This comprehensive story of Taft-Peirce Chucks and accessories will be helpful in chuck selection and application. Contains data on complete Taft-Peirce line. Send for your copy today.



Magnetic Angle Iron is an ingenious inspection and layout device. Combines universal right angle iron and magnetic chuck to speed workholding and eliminate clamping. Used on side, back and ends.

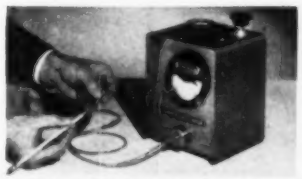


Magnetic Work Drivers provide a complete, low-cost tooling setup for finishing bearing races and other circular parts. Can be designed to handle work from ½" ID and higher.



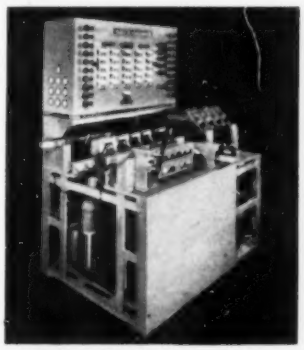
Taft-Peirce Magnetic Parallels and V-Blocks increase utility of magnetic chucks. Especially useful when it is necessary to carry chuck's magnetic holding power well above the face plate level.

A Complete Line of INSTRUMENT GAGING



Taft-Peirce Air Capsules provide an accurate, low-cost method for gaging. Air-actuated, direct contact measuring devices, they replace dial indicators and micrometer heads. They can also be used as sensing devices in continuous process inspection.

Versachek Electronic Gage is an extremely accurate, unusually flexible gaging "package" for all types of close tolerance inspection. Features four switch-selected magnifications, frictionless pick-up heads, exclusive self-calibration, and easy portability.



CompAIRamatic Gaging Systems are designed and produced by Taft-Peirce to provide automatic inspection and sorting for practically all types of products. Submit your gaging problem to Taft-Peirce for recommendations. Call or write, today.

TAKE IT TO TAFT-PEIRCE

TP

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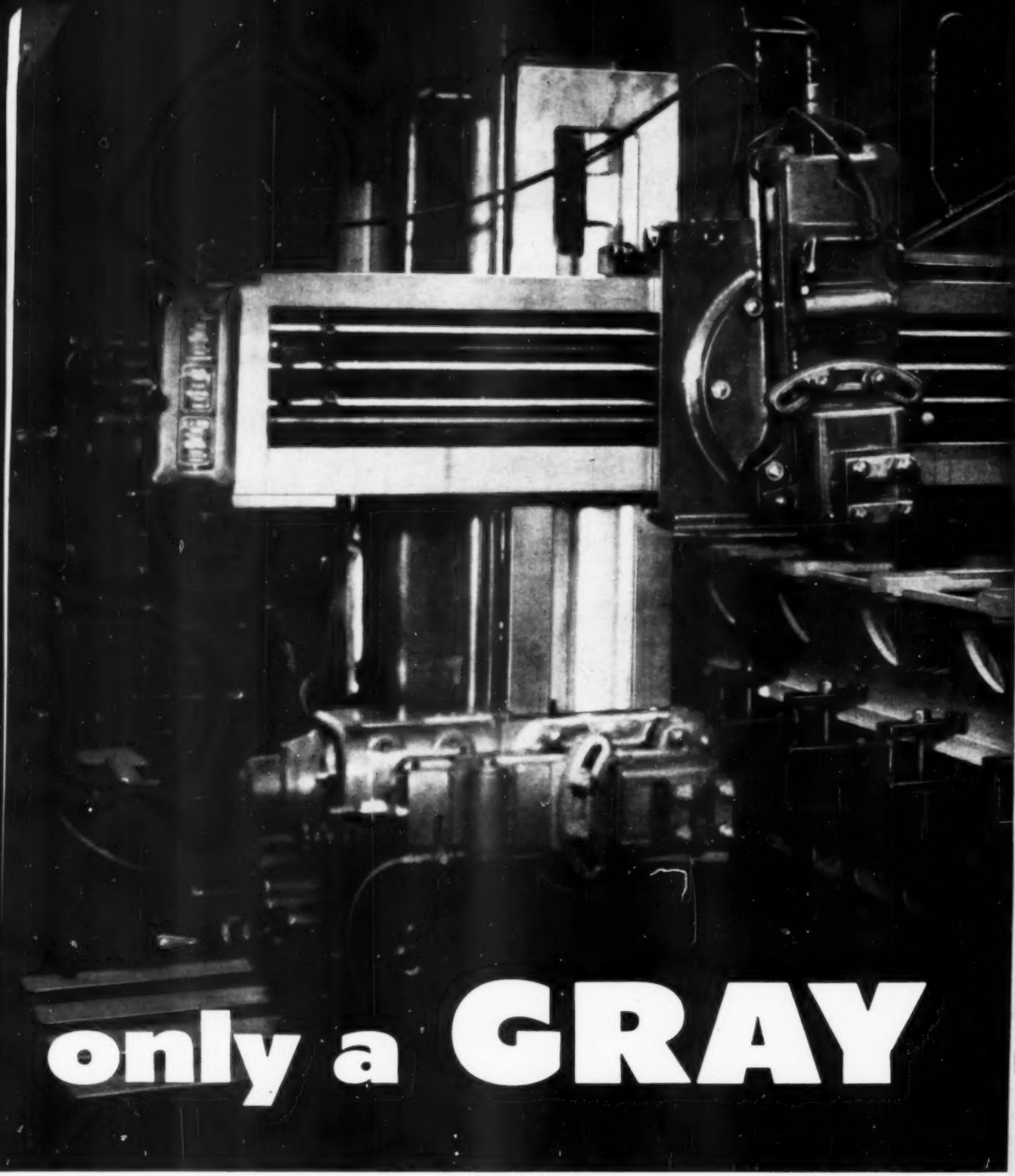
TPS-20



only a GRAY

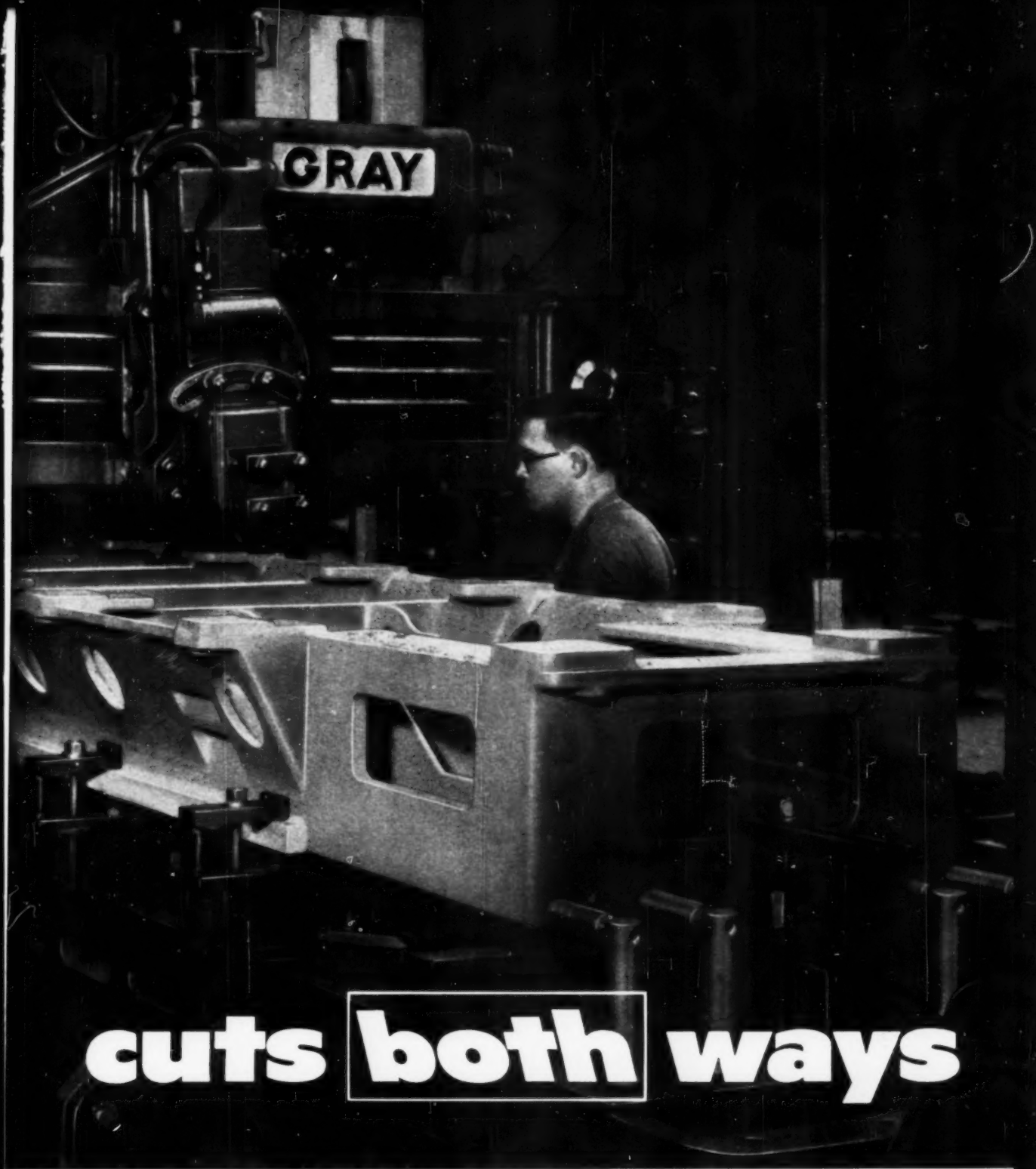
Cuts going—cuts coming . . . that's "double-cutting" with the GRAY Universal Planer. At Textile Machine Works, Reading, Pennsylvania, this new GRAY is pictured double-cut carbide planing a Tricot Machine Base. Former floor to floor time of 62 hours has been slashed to 12 hours by the enormous productive potential of the new GRAY that cuts both ways.

The G. A. GRAY Co., Cincinnati, Ohio.

CIRCLE 177 READER SERVICE CARD

heavy-duty planing

The Gray Universal is the world's most powerful planer available for conventional planing. Its rigidity and speed are ideally suited for modern carbide cutting.



cuts both ways

double-cutting

The flick of a lever, the touch of a button permits double-cutting. Elimination of the idle stroke insures the world's most efficient flat surface machining. Only simple carbide tools are required.

triple-cutting

Rough and rough-finish plane at the same time. Rough by double-cut planing and simultaneously rough-finish with a single point tool. Then finish plane without a tool change.

cross planing

Eliminates extra settings by cross planing the occasional keyways, chamfered corners, and other troublesome small cross surfaces that formerly added hours to your set-up time.

CIRCLE 178 READER SERVICE CARD

JONES & LAMSON MACHINE TOOLS

the man who needs
a new machine tool is
already paying for it

Brand-new! A fully automatic tracing lathe

This new J & L Model 30 Fully Automatic Tracing Lathe combines a number of flexible designed features, *and it's competitively priced.* The basic J & L ingredients of extra ruggedness and extreme precision are apparent throughout. (Note the unusual solidness of the tracing slide, for instance.) Specifically, it offers 1. *Fast and flexible set-ups* which are extremely simple, and accessible to the operator, 2. *Compact and convenient controls* for push-button programming of the automatic cycle, 3. *Automatic speed and feed changes* during a cut, 4. *Work handling facilities* that can be either automatic or manual (there's plenty of room for chip disposal, too).

In addition, this machine will accommodate any one of three different rear slides. It also offers a choice of two different headstocks. Moreover, the stylus and template are high and dry.

Details and specifications are contained in our brochure No. 5810. Write for your copy. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

A NEW CUSTOMER-ORIENTED U.S. SOURCE FOR NATURAL DIAMONDS

Six announcements of major importance to users and manufacturers of abrasive products . . . . . >

NOW— a new customer-oriented

1. A new, major U.S. supplier

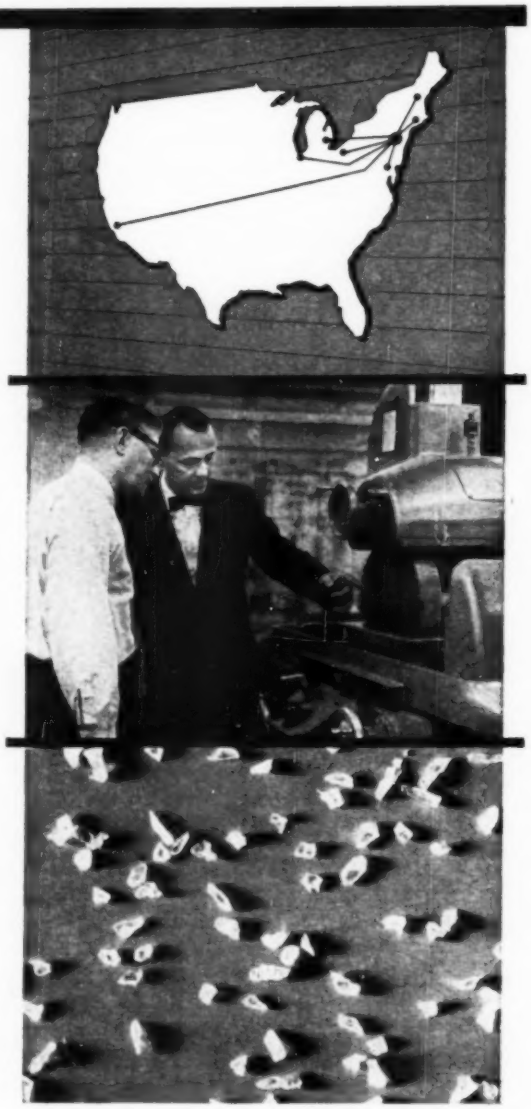
Engelhard Industries, Inc. announces the establishment of its Industrial Diamond Division—dedicated to the single objective of providing a full complement of technical sales services to purchasers and users of natural industrial diamonds. In addition to technical aids, extensive U. S. inventories, research capability and purchasing assistance, Field Representatives offer their technical services from offices in Boston, Chicago, Cleveland, Detroit, Los Angeles, Newark, New York City and Philadelphia.

2. In-plant technical assistance

This new customer-oriented business is fully prepared to assist you with your abrasives problems. From their locations in key metalworking centers, the Industrial Diamond Division's Field Engineers with their training and experience in *your* kind of tool room and production work are readily available. This "industrial diamond task force" gives in-plant assistance whenever, wherever needed.

3. A new grit for increased wheel life

Performance in the range of 30% longer life for natural diamond resinoid-bonded grinding wheels is made possible by new "SND" (Selected Natural Diamonds) grit. This dramatic development permits constant exposure of only the optimum cutting surfaces in the wheel, and prevents the grit from being prematurely forced out of the bond. Ask your grinding wheel representative about SND-Resinoid natural diamond wheels, or write direct to Engelhard Industries for complete information.



ABOUT ENGELHARD INDUSTRIES . . .

Started in 1889, Engelhard Industries, Inc. is a major American industrial complex serving the world from home offices in Newark, N. J.

Although it is perhaps best recognized in the precious metals field, the Engelhard group produces diverse products for virtually all industries, including metal products manufacturing, iron and steel, aircraft and missiles, electronics, nucleonics, chemical and petroleum production.

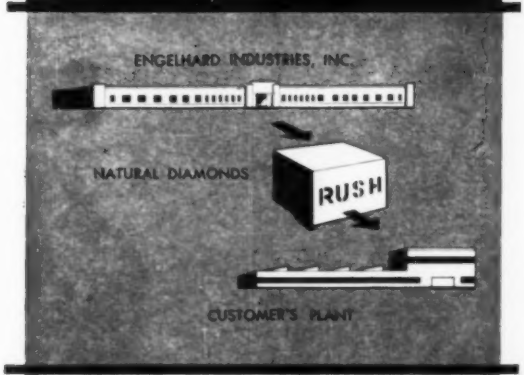
Engelhard Industries' technical interest in the uses of industrial diamonds has developed from its own production testing and engineering investigation to its present widespread activity at the basic research and application levels.

Today, through its new Industrial Diamond Division, Engelhard Industries has combined its experience and facilities in the field of natural diamonds to supply and service the specific requirements of U. S. industry.

U.S. source for natural diamonds

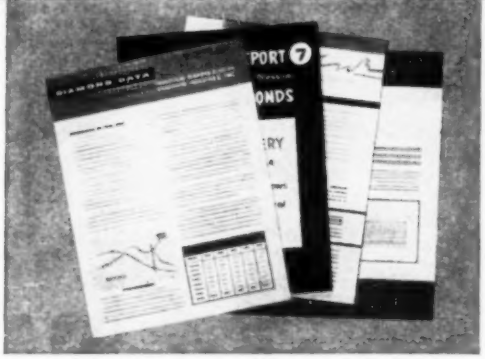
4. 'Diamond Tech Lab'

Experienced metallurgical engineers, tooling and abrasive experts and other specialists staff the newly-formed Diamond Technology Laboratory—a customer service facility in Newark, N. J. Created to solve technical problems in the application of industrial diamonds, the "Diamond Tech Lab" is cooperating with diamond wheel and tool manufacturers, as well as with the end-user of industrial diamond products.



5. 'Off-the-shelf' availability

Engelhard Industries stocks natural diamonds in a complete range of sizes and shapes, in quantities to continually satisfy the needs of American industry. These stocks include fragmented boart, grit (standard, SND-treated or untreated) and larger industrial stones for setting and drilling applications. These stocks will greatly reduce inventory investments, cut delivery cycles and expedite the purchase of industrial diamonds.



6. Technical information service

The Industrial Diamond Division provides a new and complete technical information service to help keep you abreast of the latest developments in diamond products and applications. These new Technical Bulletins will be sent to you without obligation. Simply send us your name, title and company address and we will place your name on our Diamond Technical Bulletin mailing list.

ENGELHARD INDUSTRIES, INC.

INDUSTRIAL DIAMOND DIV.
113 ASTOR STREET • NEWARK 2, N. J.

DOMESTIC DIVISIONS: AMERICAN PLATINUM & SILVER DIVISION • AMERSIL QUARTZ DIVISION • BAKER CONTACT DIVISION • BAKER DENTAL DIVISION • BAKER SETTING DIVISION • BAKER PLATINUM DIVISION • CHEMICAL DIVISION • EAST NEWARK INDUSTRIAL CENTER • HANOVIA LAMP DIVISION • HANOVIA LIQUID GOLD DIVISION • INDUSTRIAL DIAMOND DIVISION • INSTRUMENTS AND SYSTEMS DIVISION • IRVINGTON-BAKER REFINING DIVISION • D. E. MAKEPEACE DIVISION • NATIONAL ELECTRIC INSTRUMENT DIVISION • RESEARCH AND DEVELOPMENT DIVISION • H. A. WILSON DIVISION.
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ELMIRA, N.Y.

High Speed Precision

MILLING MACHINES

*The **RIGHT** Size For Work*
Too Small for Heavy Duty Millers.

- 1⅛" Collet Capacity Dividing Head and Cutter Spindles
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- Eight Spindle Speeds — 110 to 1850 R.P.M.
- Plain or Universal

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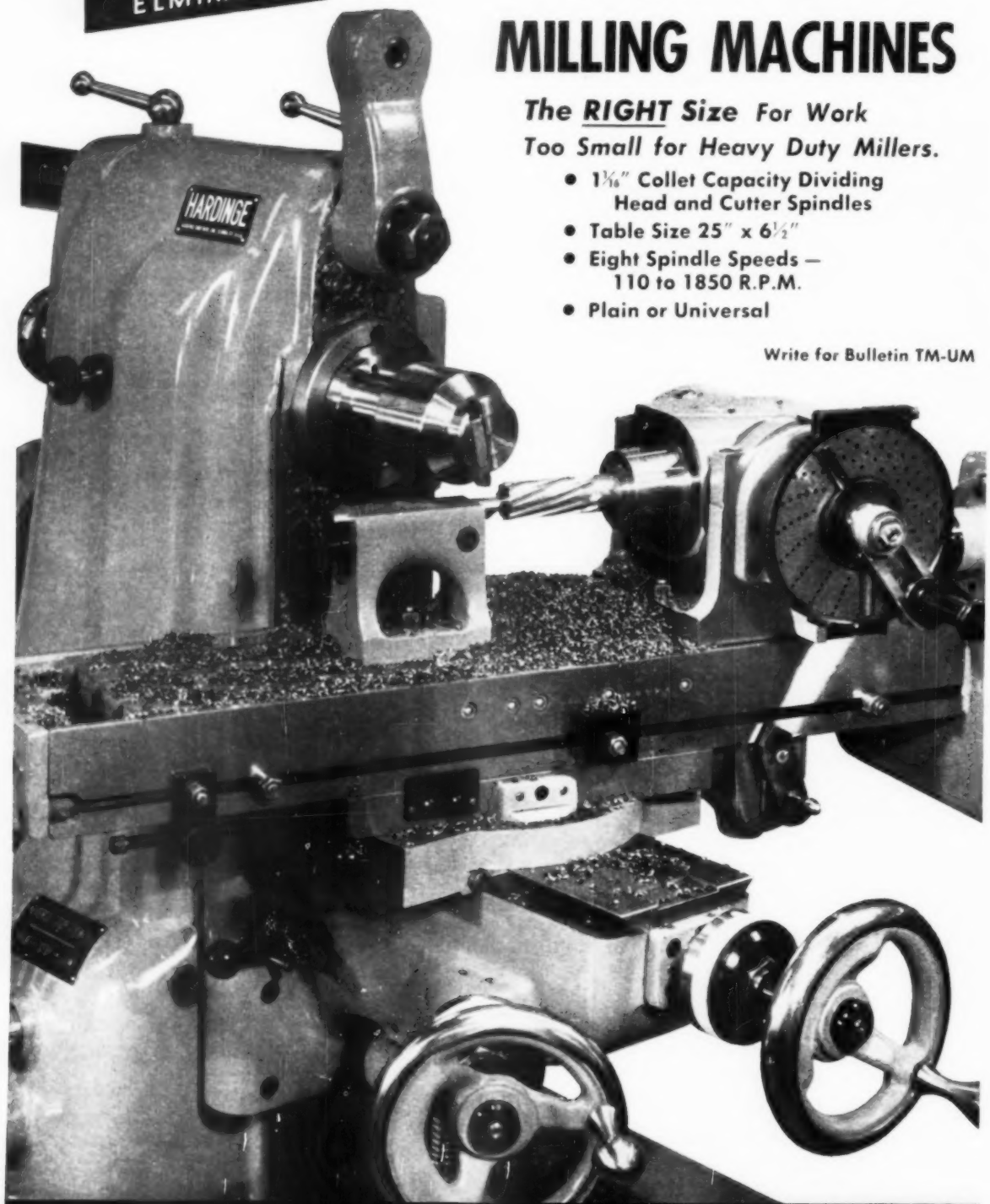
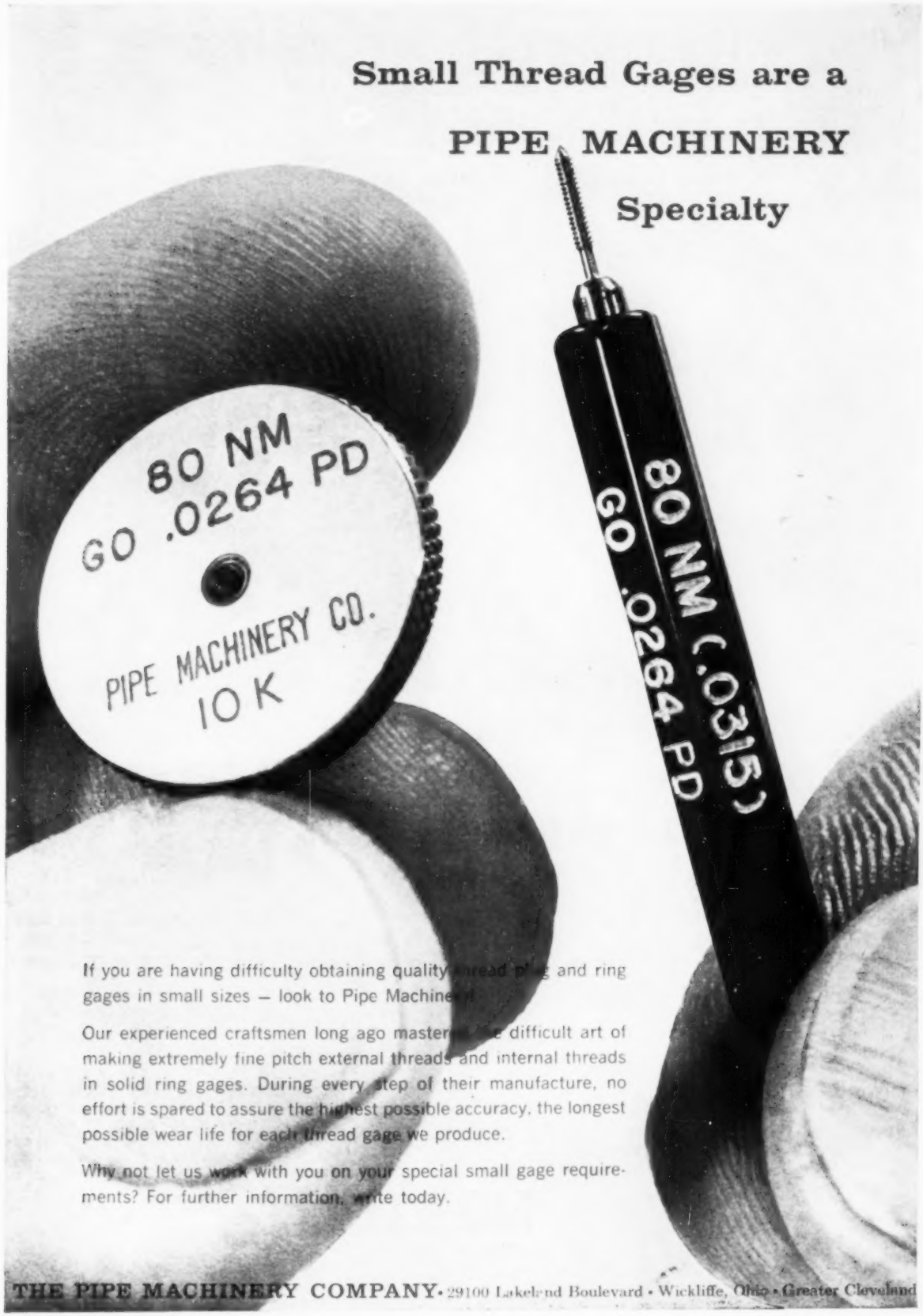


HARDINGE BROTHERS, INC., ELMIRA, N. Y.

Small Thread Gages are a PIPE MACHINERY Specialty

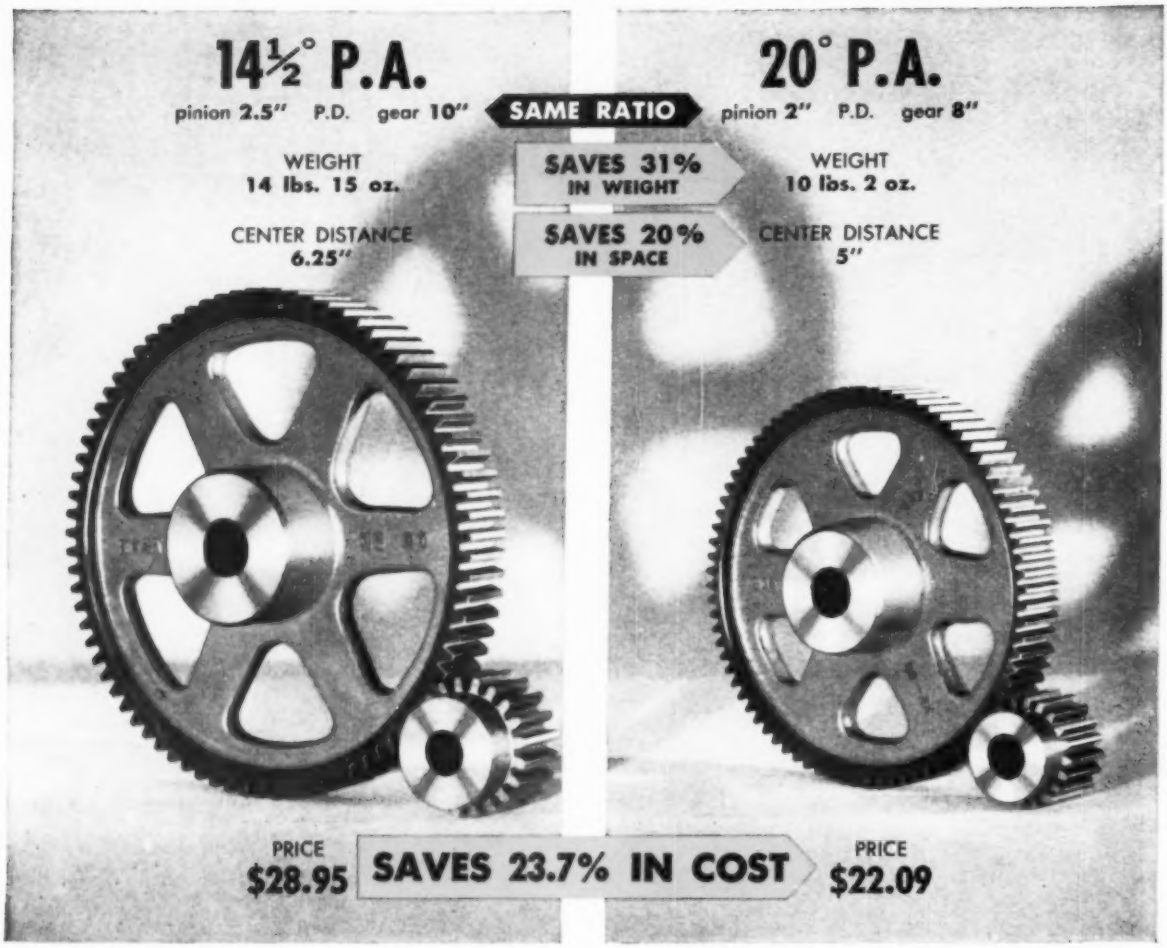


If you are having difficulty obtaining quality thread plug and ring gages in small sizes — look to Pipe Machinery.

Our experienced craftsmen long ago mastered the difficult art of making extremely fine pitch external threads and internal threads in solid ring gages. During every step of their manufacture, no effort is spared to assure the highest possible accuracy, the longest possible wear life for each thread gage we produce.

Why not let us work with you on your special small gage requirements? For further information, write today.

THE PIPE MACHINERY COMPANY · 29100 Lakeland Boulevard · Wickliffe, Ohio · Greater Cleveland



Both meet the job specifications — but

one of these gear sets costs you 23% less

NOW...567 STANDARD SIZES OF BOSTON 20 P.A. GEARS FROM STOCK

SPUR Steel and Iron 20 to 4 P.
Fine Pitch Brass 64, 48, 32, and 24 P.

MITER Cast Iron 8 to 2½ P. Steel 48 to 4 P.
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For complete listings see the BOSTON GEAR CATALOG No. 57

Every engineer knows the quiet-running efficiency and high strength of the 20° Pressure Angle tooth form. For most installations, the 20° P. A. Gear that meets specifications saves an average of 20% in space, weight, and cost over the comparable 14½° P. A. Gear required.

Now, the types and sizes of 20° P. A. Gears you need to make these big savings in your assemblies are available, anywhere in industrial U.S.A. and Canada, FROM STOCK at over 100 conveniently located BOSTON GEAR Distributors.

Your local Distributor's factory-trained gear specialist is at your service. Get details. Start *making* the savings you've been missing. Boston Gear Works, 60 Hayward St., Quincy, Mass.

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no need for Obsolescence

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VERTICAL TURRET LATHES

Model 75

In May, 1955, Hyster Company, Peoria, Illinois, installed a 36" Cut Master V.T.L., Model 75 and by the end of 1956 it was evident that due to increased requirements an automatically controlled machine was necessary. *Did this obsolete the Cut Master?* — No sir — it only meant adding a Man-Au-Trol Conversion Unit to Cut Master *right in their plant. And it was accomplished in only four days.* No need to obsolete Bullard Cut Master, Model 75 — just convert them.

another way to cut costs when cutting metal — **buy BULLARD**

36" Bullard Cut Master V.T.L. Model 75 manually controlled from Pendant Control.

Bullard Service Engineer guides Man-Au-Trol Conversion Unit into place.

Electrical connections for Man-Au-Trol are wired into Cut Master Control Panel.

Man-Au-Trol installed for automatic control of Turret Head.

For the complete information on Bullard Vertical Lathes call our nearest Sales Office or Distributor.

THE BULLARD COMPANY

BRIDGEPORT 9, CONNECTICUT

18000 cylinders

are machined daily by one of the

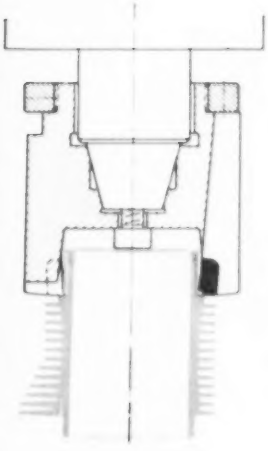
largest Motor Car Manufacturers in Europe

on a production line with heavy duty automatic Hüller special purpose machines.

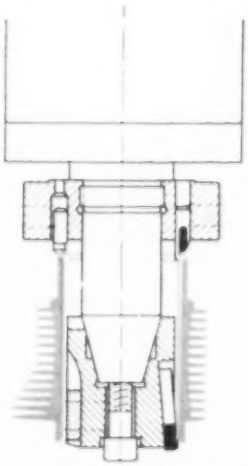
2 workpieces are machined simultaneously at each of 3 stations.

Station 1: boring outside spigot.
Station 2: roughing of the bore, spot-facing and chamfering of the front faces.
Station 3: semi-finishing of bore and spigot.

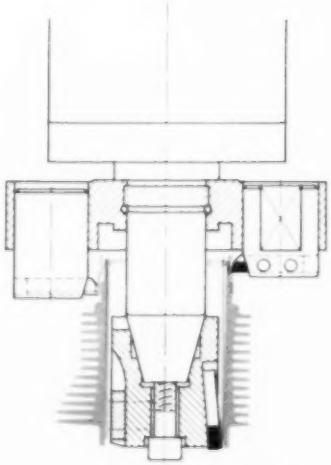
Hydr. automatic clamping and releasing of workpieces.



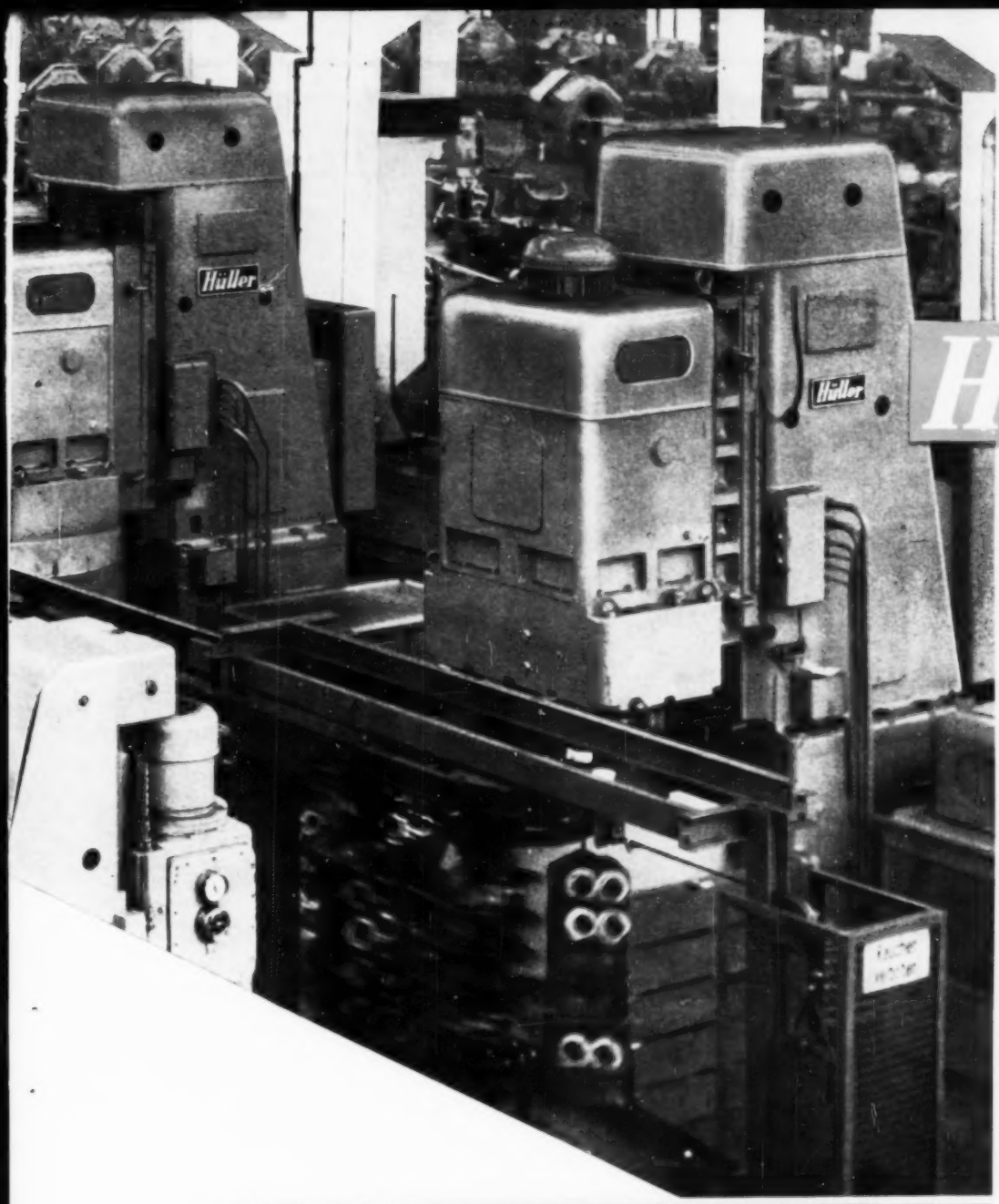
Station 1



Station 2



Station 3



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KARL HÜLLER GMBH. MACHINE TOOL MANUFACTURERS LUDWIGSBURG/WURTT./GERMANY

Agents for Canada and America:

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Galt / Canada

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Allison-Campbell

ABRASIVE CUTTING KNOW-HOW

ACCO for Better Values

With this Campbell Machine, you can--

Cut 6-inch Diameter Hard Alloys-Cleanly and Accurately-in Less Than 3 Minutes!

• This Campbell wet abrasive cutting machine—the Model 406—will cut tubing, bar stock, angle iron, or any other shape up to 6" round or square—and it will cut practically *any* material, including the new super alloys and exotic metals. Like all Campbell machines, it's designed to give *accurate* cuts, quickly and cleanly.

HIGH SPEED—4 to 8 seconds per square inch is the normal cutting speed for all Campbell wet abrasive cutting machines. For instance, you can cut 6" diameter hardened steel in less than 3 minutes.

ACCURACY—Campbell machines are production machine tools. They cut within close tolerances to reduce rejects and scrap loss. For example, the Model 406 will cut 3" diameter material to lengths within ±.010", 6" diameter within ±.030".

FINE FINISH—Additional finishing operations are rarely required. There is no burn, and burr has been reduced to an absolute minimum.

POWER OSCILLATION—On an oscillating-type machine such as the Model 406, the cutting wheel is moved horizontally back and forth *across* the cut as the wheel is fed downward. The result—greater cutting capacity, with longer wheel life.

PROPER COOLANT APPLICATION—Large reservoir and a 33 gallon/minute pump provide high volume of coolant. Unique Campbell distributor applies coolant equally to both sides of the wheel—an essential requirement for accurate cuts.

OTHER CAMPBELL MACHINES FOR ANY CUT-OFF NEED

Choose from four types of Campbell machines for wet or dry cutting—chop stroke, oscillating, horizontal or rotary—with capacities up to 14" rounds, 12" billets, plate up to 6" thick and 20 ft. long.

Regardless of your application, you'll find that a Campbell machine provides you with the best cut-off method for modern production techniques—far more efficient, accurate and economical for cutting many materials than other cutting equipment.

WRITE FOR DETAILS—Bulletin DH-260 gives the complete story on the Campbell Model 406 abrasive cutting machine. We'll also be glad to send you information on other machines; just tell us your cut-off application. And remember—your Allison-Campbell Field Engineer is an abrasive cutting specialist. Call on him for expert advice.

ACCO

CAMPBELL ABRASIVE CUTTING MACHINES

Allison-Campbell Division • American Chain & Cable Company, Inc.

923 Connecticut Avenue, Bridgeport 2, Conn.

BATH *Tap'n Gage* TIMES

A series of technical discussions that will be helpful in getting better results from tapping and gaging operations

Vol. 1 No. 12

Subject: Acme Screw Threads

Acme screw threads were formulated prior to 1895 and were intended to replace square threads and a variety of threads of other forms used chiefly for the purpose of producing traversing motions on machines, tools and in similar applications. They are now used for many parts in valves, jacks and other mechanisms. The basic characteristic of an acme thread is the 29 degree included thread angle.

General Purpose Acme Thread Classes:

There are three classes of general purpose threads. They are known as 2G, 3G and 4G. Class 2G is the preferable choice for general assemblies. Classes 3G and 4G are provided for cases where less backlash or end play is desired. External threads of any class may be assembled with internal threads of any other class to provide different degrees of backlash or end play.

Centralizing Acme Thread Classes:

There are five classes of centralizing threads. They are known as 2C, 3C, 4C, 5C and 6C. Class 2C provides the maximum backlash or end play. Classes 3C, 4C, 5C and 6C are provided for cases where less backlash or end play is desired. While external and internal threads of the same class are recommended for centralizing assemblies, different amounts of backlash and end play may require interchanging the classes.

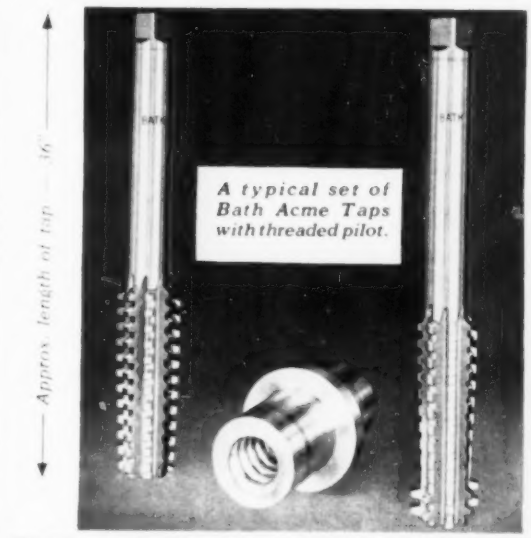
Uses of General Purpose and Centralizing Acmes:

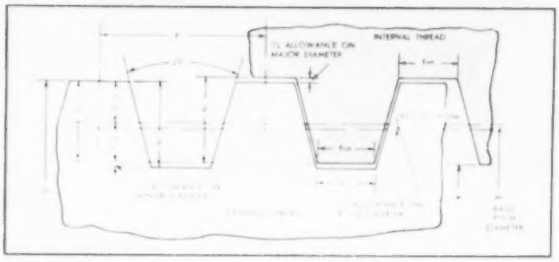
General purpose threads have clearances on all diameters for free movement and may be used in assemblies with the nut rigidly fixed and movement of the screw in a direction perpendicular to the axis limited by the screw bearing or bearings. Centralizing threads have a limited clearance at major diameter of screw and nut so that bearing at major diameter maintains approximate alignment of the thread axis and prevents wedging on the flanks of the thread. In any case sufficient end play must be left to provide a close running fit. Multiple threads should be considered when fast relative motion is required.

Ordering Acme Taps:

The problems involved in tapping acme threads vary greatly and because of this it is very important to supply the tap manufacturer with complete information about the job. In many cases it is necessary to design sets of taps with the style and number dependent on the diameter and pitch, number of pieces to be tapped, surface finish of thread required, material to be tapped, length of thread and other considerations.

When ordering be sure to give: 1. Nominal size and threads per inch. 2. Single, double, triple or quadruple thread. 3. Lead. 4. Right or left hand. 5. Pitch diameter or class of thread. 6. Description of previous taps. 7. Material. 8. Length of nut, opened or closed — and clearance. 9. Diameter of hole before tapping. 10. Type of machine to be used. 11. Are taps to be used for sizing of rough chased threads. 12. Furnish part drawing or sketch. (Upon request, a special form will be provided by Bath for ordering).





Gaging Acme Threads:

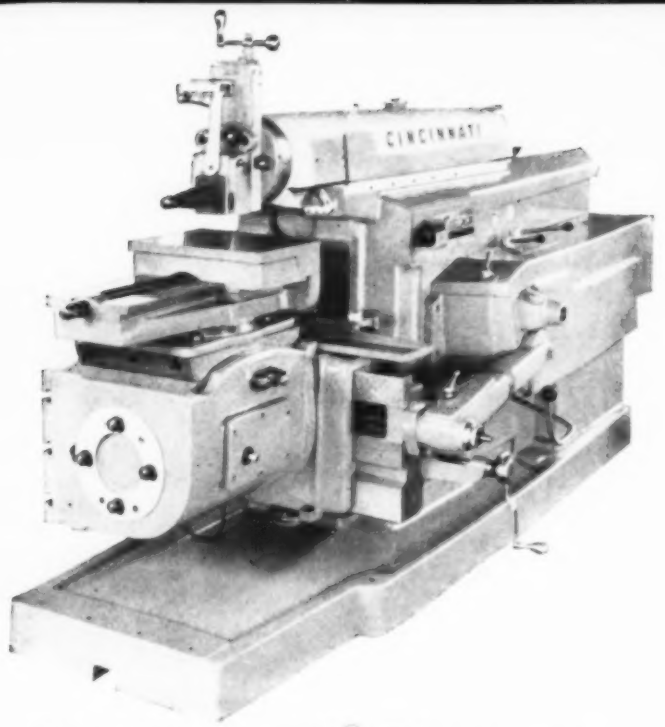
General purpose threads may be adequately gaged by the use of "go" and "not go" plug and ring thread gages representing the product limits. Design should be in accordance with the principle that the "go" gage should check simultaneously as many elements as possible and the "not go" gage can effectively check but one element. Centralizing threads are gaged in the same manner and following the same principles as with general purpose threads except that two "not go" plug gages are required because of the close tolerance major diameter. One gage checks pitch diameter — the other major diameter.

Reference: U.S. Dept. of Commerce Handbook H28, A.S.A. Pamphlet B.1.9

• Cylindrical and Thread Gages • Ground Thread Taps • Internal Micrometers John BATH & Co., Inc.
22 Mann Street, Worcester, Mass.

John Bath & Co., Inc., 28 Mann Street, Worcester, Mass.

CIRCLE 190 READER SERVICE CARD



Cincinnati® Shaper standard features: extra savings at no extra cost

Cincinnati Shapers give you so many money-saving features per dollar invested that they can be the most profitable equipment in your shop.

1. This 2" cut, .030" feed on a 24" H. D. Cincinnati® Rigid Shaper, demonstrates the ability of the 50 psi automatic lubrication system to maintain oil films under heavy loads.

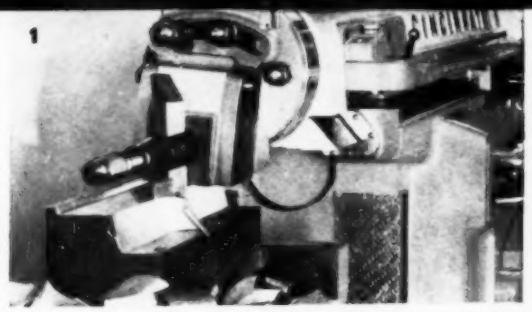
2. Brushless electromagnetic brake and clutch insure fast, easy operation. No adjustment is required.

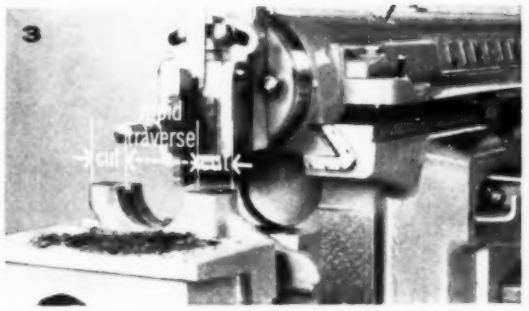
3. Both vertical and horizontal rapid traverse are standard Cincinnati features which substantially reduce setup and cutting time.

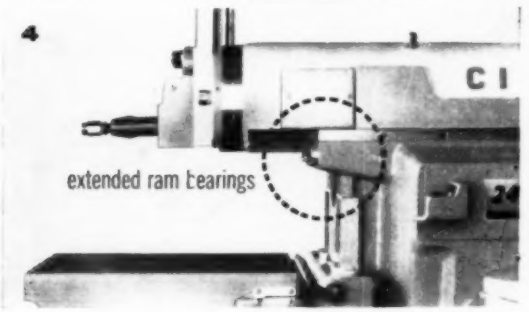
4. Extended ramway bearings increase ram support and minimize wear. Full table clearance to the column gets work closer to the column, minimizes overhang.

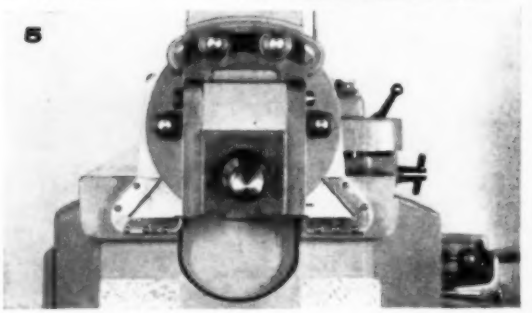
5. The vee ramways are integrally cast with the column. Ramway rigidity is increased by eliminating joints. Full length tapered gib provides for easy adjustment, maintains accuracy.

Write Dept. A for Catalog N-7.









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THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio

CIRCLE 191 READER SERVICE CARD

When you replace . . . it should be a MILBAND
Milband
• fast cut-off sawing
• low cost per cut
• positive blade control
• increased blade life

A modern band saw cut-off machine tool designed for operation with high speed steel blades, the MILBAND offers much faster cut-off sawing, greatly reduced chip loss, and cuts consistently smoother, straighter and more accurately. *Your* next investment in cut-off equipment *should* be a MILBAND!

The circular featured above covers all the important facts about the many advantages offered by continuous-action band sawing. It also covers all the design and construction features that make the MILBAND Machine Tool today's (AND tomorrow's) wisest investment in a cut-off machine. Use the coupon below to send for your free copy, and check the facts for yourself. If you want additional dollars-and-cents proof, we'll be glad to run actual tests on a MILBAND Band Saw Machine Tool and submit a complete time-and-cost analysis report.

MILBAND MACHINE TOOL DIVISION

THE HENRY G. THOMPSON & SON CO. NEW HAVEN 5, CONNECTICUT

Saw Specialists For Over 80 Years

HACK SAW & BAND SAW BLADES • HOLE SAWS • GROUND FLAT STOCK
MILFORD
FILE IN AND MAIL TODAY!

THE HENRY G. THOMPSON & SON CO.
271 Chapel St, New Haven 5, Conn.

☐ Please send my free copy of the MILFORD circular giving complete information on the modern, band saw cut-off method with the MILBAND Band Saw Machine Tool.

name_____ position_____

company_____

co. address_____

city_____ zone_____ state_____

SPEED-BAND®
the newest concept in band saw blades—made from L-100-M, a double carbide alloy developed *especially* for band saws. Its hot hardness and abrasion resistance effect extraordinary results.

Available only from Capewell Distributors, of course

CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

No scandal here

Dear Sirs:
We were much interested in your article suggesting that "Our apprentice setup is a SCANDAL" (*AM*—Sept 21 '59, p124). We might be inclined to agree with you except that we suspect a number of companies must be alert enough to want to do something about this situation. At any rate, New Hampshire Ball Bearings, Inc, has tackled the problem in a concrete way—by establishing an Apprentice Training Program.

Realizing that we more or less have to grow our own future machinists, tool and die makers, inspectors, foremen, and plant superintendents, we are taking high school graduates and giving them a basic understanding of the metalworking field. Not only that, but the humanities are not overlooked. And the trainees earn while they learn.

The program is now in its third year and has for the first time become co-educational. We derive a great deal of pleasure in watching the metamorphosis from farm-boy into first-class toolmaker. Results have led us to plan further broadening and expansion of the program.

A N Daniels, *president*
New Hampshire Ball Bearings Inc
Peterborough, NH

Electron-beam rebuttal

Dear Sirs:
In the article, "How good is electron-beam welding?" (*AM* — Sept 21 '59, p113) a statement was made as follows:

"At the same time, consistent and uniform weld penetration in Zircaloy-2 was limited to 0.050 in., and slow welding speeds, multiple welding passes . . . were required for low-voltage equipment . . ."

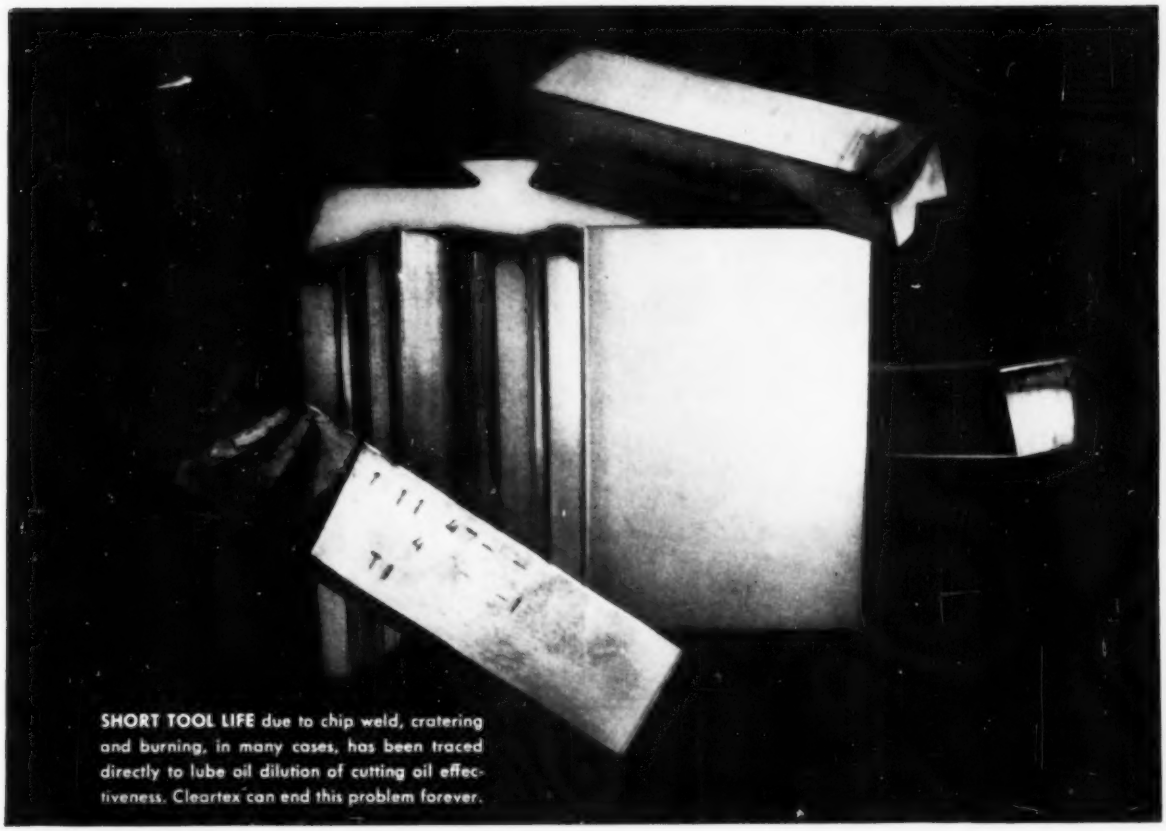
I would like to comment that I have repeatedly made 0.125-in.-thick butt welds on Zircaloy-2 with the NRC 20 KV electron-beam welder in a single pass with full and uniform penetration at approximately 10 ipm welding speed (at 20 KV and 60 ma).

Obviously, with lower voltages comparatively large energy inputs were required, and the depth-to-width ratio was closer to ½ than 2. However, the penetration, as such, is a function of

SHOPMATES

N. Jarvis

THE CHIP CLIPPER BROKE DOWN! I OILED IT... GREASED IT... CHANGED THE CAMS AN' THE DRIVE CHAIN... AND IT STILL WON'T WORK!!
GIVE IT A KICK ... OR A RAP WITH A HAMMER ... THAT'S ALL THE OTHERS DO!
I TRIED TO TELL HIM IF YOU CAN'T FIX IT HIDE IT !!



SHORT TOOL LIFE due to chip weld, cratering and burning, in many cases, has been traced directly to lube oil dilution of cutting oil effectiveness. Cleartex can end this problem forever.

Diluted cutting oil shortens tool life drastically

Lubricating oil is probably leaking into the cutting oil sumps of your automatic screw machines as you read this. Current research proves that this is happening in 70% of all the automatics in use today! And where it happens, it shortens tool life by as much as 50%—even 70%. On top of this, the cost of extra regrinds, lost production during tool changes, and excessive scrap production is putting a premium on screw machine operation in too many shops.

Look for these symptoms. One sure sign of dilution is the need for frequent refilling of the lube oil sump. If you are using an ordinary lube oil, this dilution will create two additional—and more costly—symptoms: excessive scrap production and frequent regrinds. Now you can eliminate these forever with the

TEXACO CLEARTEX CURE

The exceptional chemical stability and load-carrying ability of Texaco's Cleartex series make them equally suitable for use as cutting oils, lubricants or hydraulic fluids. All you have to do is use them for both cutting *and* lubrication. With Cleartex in *all* your sumps, you'll find cutting oil dilution will stop and screw machine production cost will drop substantially.

Write today for your copy of Texaco's helpful new booklet "Cleartex in Automatic Screw Machines"...and contact your local Texaco Lubrication Engineer for an authoritative survey of your automatics. Just call the nearest of the more than 2,000 Texaco Distributing Plants, or write Texaco Inc., 135 East 42nd Street, New York 17, N. Y., Dept. AM-24.

TUNE IN: Texaco Huntley-Brinkley Report, Mon.-Fri.—NBC-TV

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

MARKS
AND GROOVES
at speeds up to
5,000 PIECES
per hour

DUAL OPERATION
saves time and money

Here is another example of the versatility, speed and economy of Noblewest modern metal marking equipment. Model 523 is shown tooled for simultaneous marking and grooving of tubular electrical connectors at production speeds up to 5000 pieces per hour. Gravity feed chute can be manually loaded or hopper fed making entire operation automatic. As with all Noblewest Roll Marking Machines, the marked inscription is permanently indented . . . lasts as long as the product itself. Whatever your marking problem, it will pay you to consult with Noblewest. For comprehensive catalog, write the Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Conn.

A few desirable territories open to qualified representatives.

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

MARKING
NUMBERING
EMBOSSING
GRADUATING

46 CIRCLE 195 READER SERVICE CARD

power input, as long as the system is reasonably free of aberrations and the beam can be focused to less than 1/16 in. spot diameter.

This article was of great interest because of the technical data included.

M H Hablanian,
chief development engr
NRC Equipment Corp
Newton Highlands, Mass

The article was a digest of an AWS paper in which W L Frankhouser and G Burton summarized the experimental work and investigations undertaken by Westinghouse Electric Corp through June 1, 1959.

We are glad to pass Reader Hablanian's amplifying comments along to other AM readers—Ed.

Missing factor

Dear Sirs:

It has been called to our attention that there was an error in the article, "Two Checks for angle-contact bearings" by Richard Smith, chief engineer, McGill Manufacturing Co, Inc (*AM*—Sept 21 '59, p115).

The error was evidently introduced in typing Mr Smith's article preparatory to submitting it to AMERICAN MACHINIST.

The third paragraph of the article should read as follows:

$$\cos \alpha = \frac{(I-2R)\ A}{I}$$

Where A is $\frac{P_d}{B_d}$, α is the contact angle, R is rotations of the retainer, I is rotations of the inner race, P_d is pitch diameter of the bearing, and B_d is the ball diameter.

I trust you will call this to the attention of your readers.

D C Whitesell,
McGill Manufacturing Co, Inc
Valparaiso, Ind

It started out just as a little lunch time poker. . . .

CALENDAR

Joint National Symposium on Reliability and Quality Control—Jan 11-13, Statler-Hilton Hotel, Washington, DC.

Society of Automotive Engineers—Annual Meeting and Display, Jan 11-15, Sheraton-Cadillac and Statler Hotels, Detroit.

Society of Plastics Engineers—Annual Technical Conference, Jan 12-15, Conrad Hilton Hotel, Chicago, Ill.

Plant Maintenance & Engineering Show & Conference—Jan 25-28, Convention Hall, Philadelphia, Pa.

Society of Vacuum Coaters—Annual Meeting, Jan 26-27, Hotel Biltmore, New York, NY.

Instrument Society of America—Instrument-Automation Conference and Exhibit, Feb 1-4, Houston Coliseum, Houston, Texas.

Society of the Plastics Industry—Reinforced Plastics Div Conference, Feb 2-4, Edgewater Beach Hotel, Chicago, Ill.

Armour Research Foundation and American Welding Society—Annual Midwest Welding Conference, Feb 3-4, Illinois Tech Chemistry Bldg, Chicago, Ill.

American Society for Metals—Golden Gate Metals Conference, Feb 4-6, Fairmont Hotel, San Francisco, Calif.

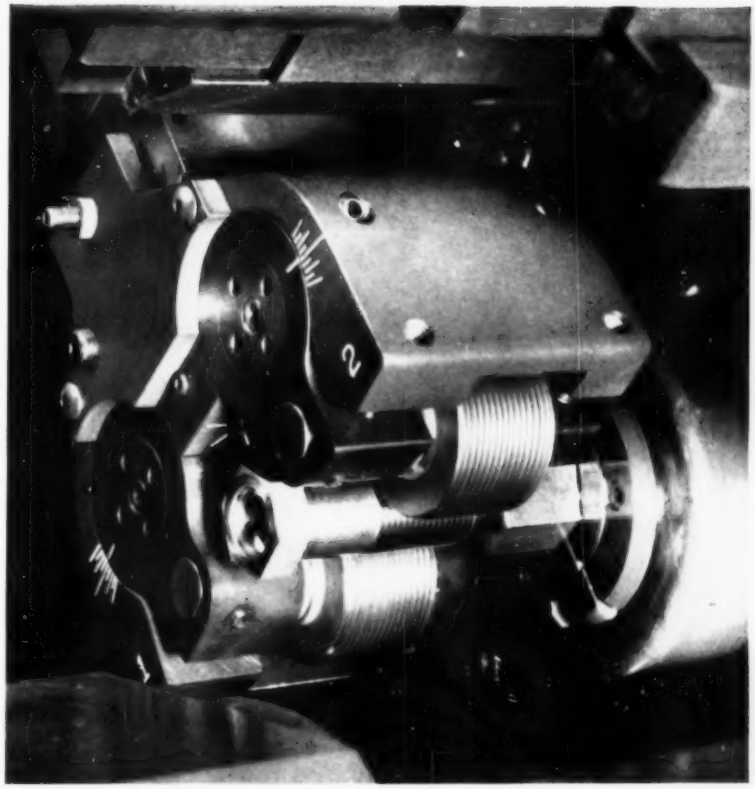
American Institute of Mining, Metallurgical, & Petroleum Engineers—Annual Meeting, Feb 14-18, Statler and McAlpin Hotels, New York, NY.

Annual Joint Conference on Automatic Techniques (ASME, IRE, AIEE)—Apr 18-19, Cleveland-Sheraton Hotel, Cleveland.

American Society of Tool Engineers—Tool Show, Apr 21-28 Artillery Armory, Detroit, Mich.

American Welding Society—Annual Convention and Welding Show, Apr 25-29, Great Western Exhibit Center, Los Angeles.

American Society for Metals—Space Age Materials Meeting, Apr 27-28, Sheraton-Gibson Hotel, Cincinnati, Ohio.



Reed Thread Rolling Attachments

feature Self Compensating Roll Action

ADVANCE COMPENSATOR
- Eliminates Strain in Gear Train
- Permits Interchanging Rolls of Same Diameter
- Allows Either Roll to Contact Work Blank First

SIDE FLOATING COMPENSATOR
With New Anti-friction Bearing Unit
- Reduces Side Thrust on Rolls
- Permits Use of Standard Diameter Rolls under varying operating conditions

ALIGNMENT COMPENSATOR
- Provides parallel alignment of rolls during rolling
- Assures smooth contacting and withdrawal of rolls

Write for your copy of Thread Rolling Attachment Bulletin B-2 for helpful information on Thread and Form Rolling

REED

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Specialists in Thread and Form Rolling Tools and Equipment

WORCESTER 1, MASSACHUSETTS, U. S. A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

Fine tools that encourage Good Work

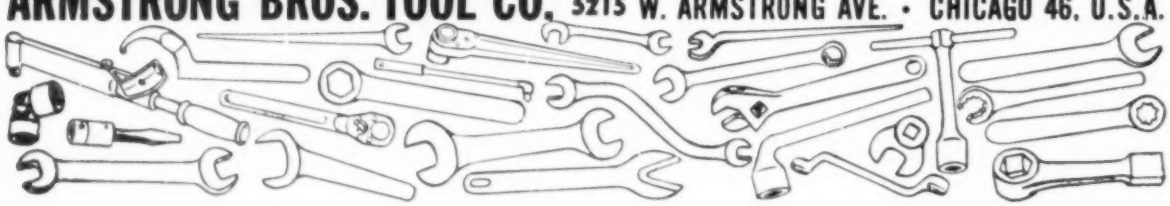
ARMSTRONG WRENCHES

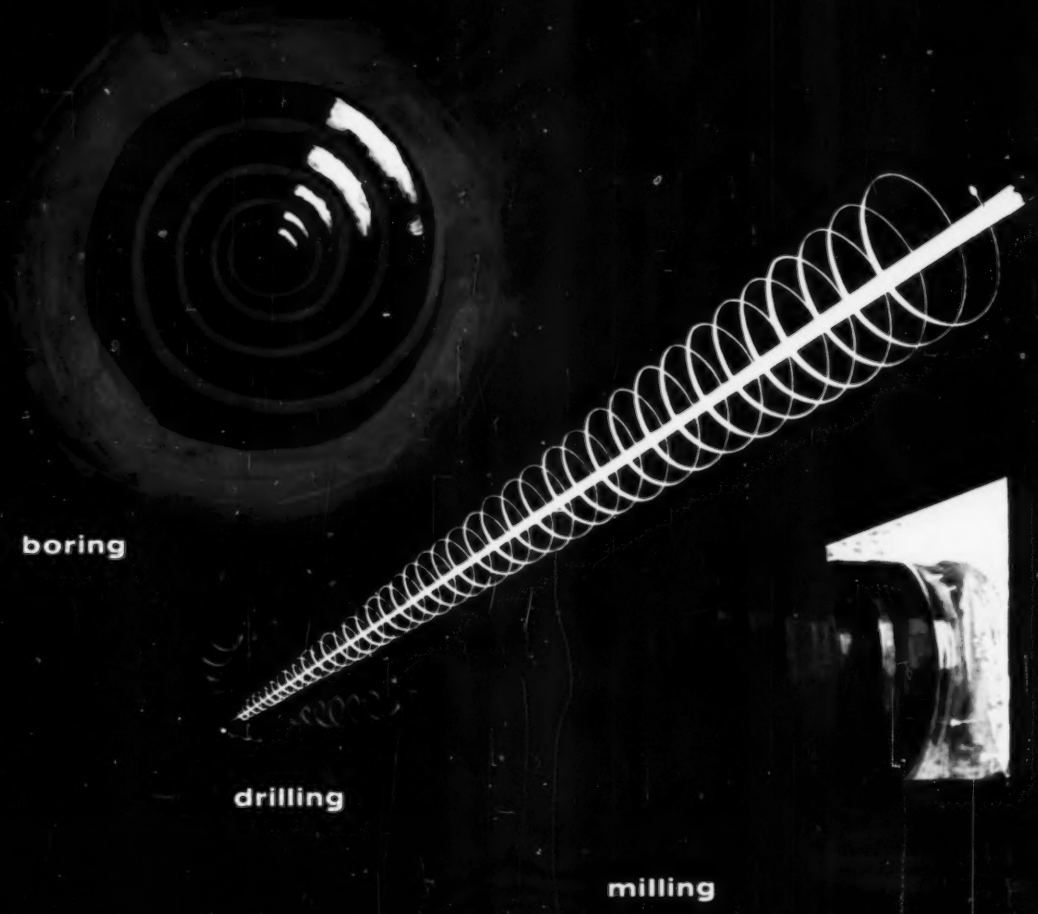
An ARMSTRONG Wrench feels right—is balanced. It goes over nuts or screw heads easily, grips firmly without sloppiness, won't round corners—because openings are carefully machined to correct sizes. It's safe, strong beyond need without clumsy bulk—because of superior design and selected steels, heat treated to proper degree of hardness and tensile strength. It's quality finished, ARMALOY (alloy steel) Wrenches in chrome plate with heads buffed; HI-TEN (carbon steel) Wrenches in baked-on gray enamel with heads ground bright . . . all plainly marked for size. All are uniformly excellent tools manufactured under strict quality control, by modern methods, with modern equipment in a modern tool plant . . . 1537 different industrial sizes and types—single wrenches, or sets in metal cases, boxes or rolls . . . each a quality tool. Armstrong Wrenches are "Fine tools that encourage good work."

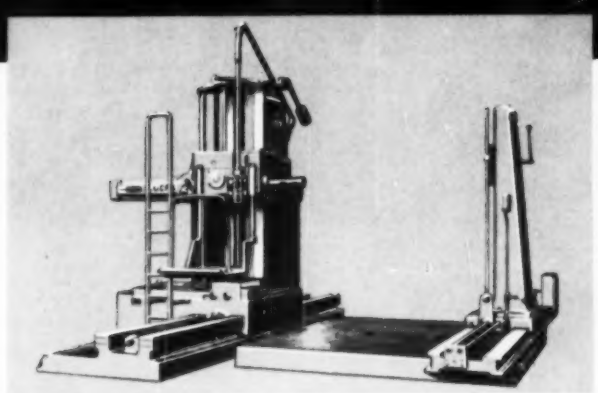
INDUSTRIAL DISTRIBUTORS · SERVING INDUSTRY ECONOMICALLY · THE RIGHT HAND OF PRODUCTION

If you don't know your local ARMSTRONG Distributor, we will send you the names of those in your area.

ARMSTRONG BROS. TOOL CO. 5215 W. ARMSTRONG AVE. • CHICAGO 46, U.S.A.



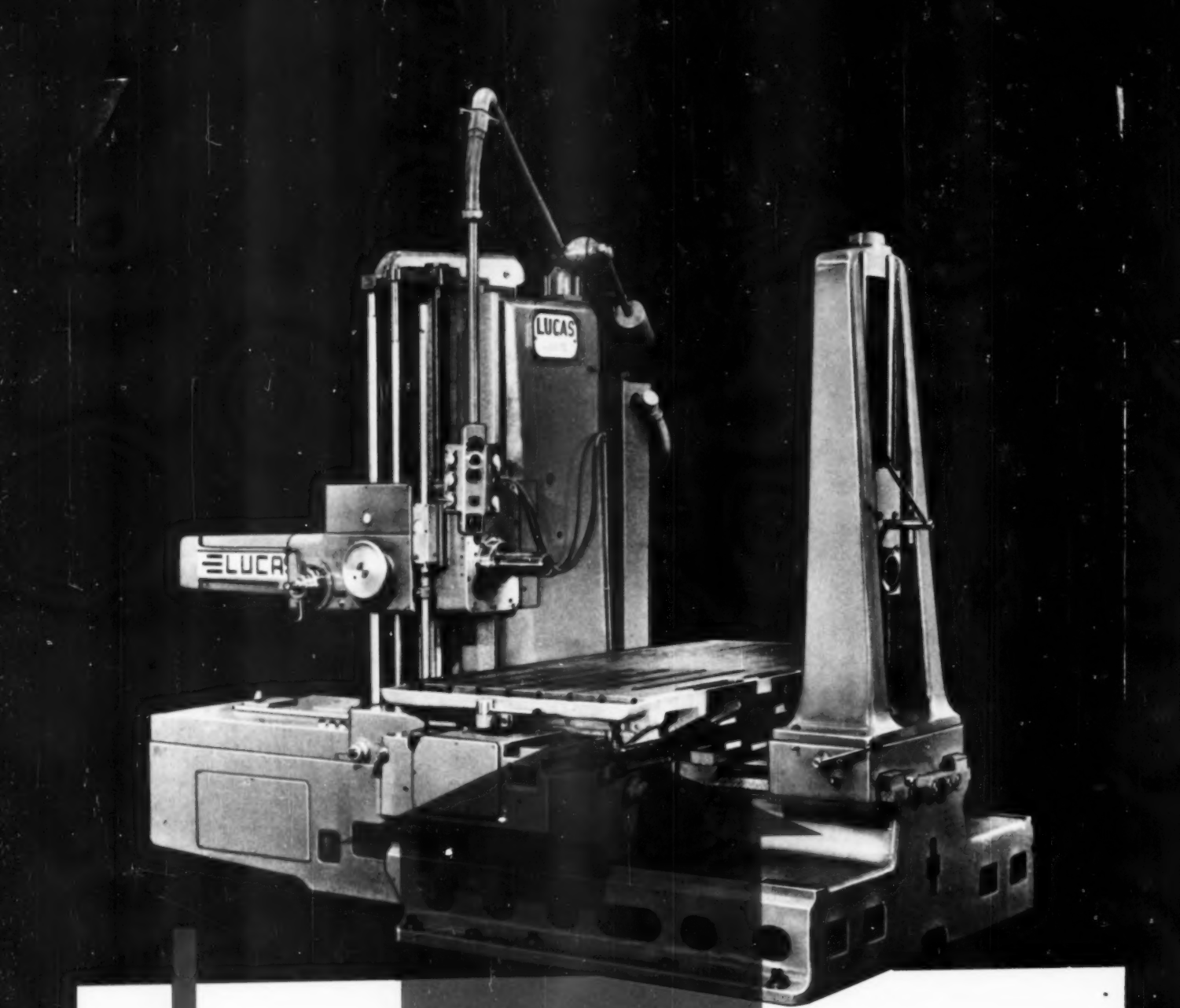




Floor type machines YES!

A complete line of floor-type, horizontal boring, drilling and milling machines in the 4″ and 5″ spindle diameter range . . . with all the features and controls available in other Lucas models. Many of these are to be found *only* in a Lucas. *Did you ever meet a man who regretted picking a Lucas?*

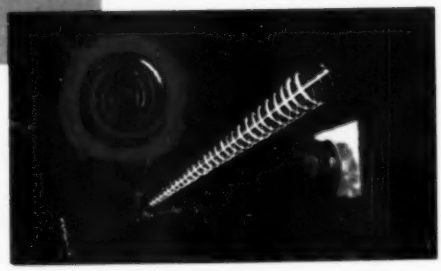
LUCAS
OF CLEVELAND



AIR LIFT*

to saddle and table

All Lucas components are fitted with the utmost precision. To insure lifetime accuracy, the saddle and table ride on lubricated compressed air . . . *ever so slightly above the surface of the ways.* Traverses, either feed or rapid, are silk-smooth and free of wear.



*Patent Pending

LUCAS
OF CLEVELAND

SPOT NEWS...

- **Ford Motor Co is reportedly readying a "compact" car.** It'll have a 90-in. wheelbase, Detroit sources say.

- **Coming into its own after eight years of product improvement in the lab** is Hydro-T-Metal, a tough corrosion-resistant alloy made by combining titanium and copper with zinc. Cheap (30 to 35¢ per lb), the new metal should find many uses in equipment exposed to weather, such as auto trim, outdoor furniture and rain gutters. (see p3).

- **After 1960, Russia reportedly will stabilize machine tool production** at about 200,000 units a year (compared with 138,000 units in 1958). By so doing, the USSR will give its satellites a chance to expand their machine tool output, too.

- **Look for the Army to switch over gradually** from gasoline-powered vehicles of all kinds (tanks, trucks, etc) to diesels. Reasons are twofold: (1) diesel operated vehicles are less likely to explode under heat generated by nuclear explosions, and (2) they're cheaper to run.

- **Complete tape programming controls for Gisholt Fastermatic turret lathes,** supplied by Westinghouse (1) operate a face check for six turret faces, (2) control turret carriage traverse, (3) select one of 16 turret carriage feed rates, (4) control turret carriage direction, (5) select one of eight different spindle speeds, (6) automatically operate an instantaneous turret carriage reversal, (7) control turret carirage position, and (8) program dwell and cycle stops.

- **Curtiss-Wright and Germany's NSU** expect to put the revolutionary NSU-Wankel (rotary combustion engine) into production in mid-1961. NSU is said to have already approached German machine tool makers with plans for building the special machines needed, particularly high-accuracy grinders.

- **Plans are under way to build a 120-in.-dia Spin Forge** at the El Segundo, Calif, plant of Hufford Division of Siegler Corp. The 37-ft-wide, 38-ft-high, 22-ft-deep machine will weigh almost 600,000 lbs, is scheduled for completion in July 1960. If necessary, machine's size will be increased to 150 in. dia. Biggest Spin Forge in operation is a 72-in.-dia model, while Hufford is also building a 96-in.-dia machine.

- **Violation of the Business & Defense Regulations Act during 1956 and 1957** has cost nine West Coast men a total of $20,000 in fines. The offense: buying nickel at 90¢ per lb under defense priority when nickel was selling on the open market for $3 per lb, then using it for non-defense production.

- **West Coast's 6% ship construction differential is being attacked** by East Coast shipbuilders. Both sides will present their cases before Congress, probably sometime in January.

- **Navy's BuShips is reportedly establishing value analysis incentive contracts** with civilian suppliers. Under terms of such contracts, any money saved by value analysis is set aside and the contractor receives a certain percentage.

- **British beryllium tube drawing techniques** will be furnished Superior Tube Co of Norristown, Pa, under terms of a "know how" agreement with Chesterfield Tube Co Ltd, which claims to hold a world lead in production of such tubes. From here on out, the two firms will coordinate R & D efforts.

Let's Talk Tape

on Monarch Turning Equipment

We'll start by saying simply—Monarch Lathes can be furnished with Numerical Control.

This modern control method has been applied with great success on certain other types of machine tools. For a long while we have been aware of interest in its possibilities on turning equipment. But the fact we offer Numerical Control does not mean we are unaware of the necessity of considering carefully the economics of each turning situation.

Where lathes are concerned, the economical application of Numerical Control depends on two factors:

1. *The number of individual jobs to be run.*
2. *The allowable time lag between completion of drawings and completion of machining.*

Are your problems a multiplicity of turning jobs and lightning-fast conversion of drawings into finished work pieces?

If the answer is "YES," the place to start talking is with *The Monarch Machine Tool Company*, Sidney, Ohio.

Let's talk!

Monarch
TURNING MACHINES

IF IT CAN BE TURNED, THERE'S A MONARCH TO DO IT BETTER AND FASTER

WASHINGTON...

Anti-tank missile orders . . .

Foreign arms makers are scrambling for military production orders for lightweight anti-tank missiles—a type of weapon the Pentagon has been unable to buy from a domestic producer. The Utica-Bend Corp's Dart missile, under development for the Army for several years, was cancelled because of cost and weight problems.

Among the leading contenders for Army and Marine orders are the WS 810 Cobra, developed by Boelkow Entwicklungen of West Germany; the "SS" series of Nord Aviation of France; the Mosquito made by Oerlikon of Switzerland, and the Vigilant by Vickers of Great Britain.

Daystrom Inc has the US sales and manufacturing rights on the Cobra, Clevite Ordnance on the Vigilant. GE is reportedly dickering for the US rights on the SS series.

The Marines have bought 100 Cobra missiles, will put them through evaluation tests next month. The Army has brought small quantities of the French SS-10 and SS-11 for testing.

Fight over patents . . .

A new controversy over federal patent policy is raging. Industry spokesmen here and some sympathetic government officials are pushing for a liberalization of policy—particularly, the policy of the National Aeronautics & Space Administration which now limits contractors' patent rights.

But there's a counter-drive from Congressional Democrats to tighten up on the patent system, to restrict contractors' rights to inventions made on government-sponsored R&D projects.

This is how patent policies on government contracts now stand:

- **On military R&D contracts,** the contractor keeps title to the patent and has the right to get royalties on commercial production of the item. But the services get a royalty-free, nonexclusive license to use the invention.
- **On AEC contracts,** the Agency acquires rights and interests in all inventions. Some lawmakers would like to see such a tight policy applied to all government agencies on contract work.
- **On NASA R&D contracts,** the Agency must take title to the invention or waive all rights. Unlike the Defense Dept, NASA cannot settle only on licensing Rights. NASA contractors complain that the waiver procedures are so "cumbersome and uncertain" that in effect the Agency's policy is as restrictive as AEC's.

The civilian space agency has already recommended that Congress modify its patent policy. NASA's idea is to provide for "discretionary" or flexible authority.

This would allow the Agency to decide whether to take title to the invention developed on a contract (the way AEC does) or to limit itself to a royalty-free license to produce (the way the Defense Dept does). NASA contractors, obviously, are plumping to bring the Agency's patent policy in line with the Pentagon's.

The outlook is uncertain. Congressional critics of the policy allowing contractors to hold patents on inventions made under government-financed R&D are girding for a push for new restrictions.

Capital expansion . . .

. . . plans of businessmen have been whittled down as a result of the steel strike. That became increasingly clear with the release of the latest government survey of plans for spending on capital plant and equipment.

Businessmen showed all through 1959 their increased confidence in the boom by reporting bigger plant and equipment spending plans in surveys taken in March, July, and September.

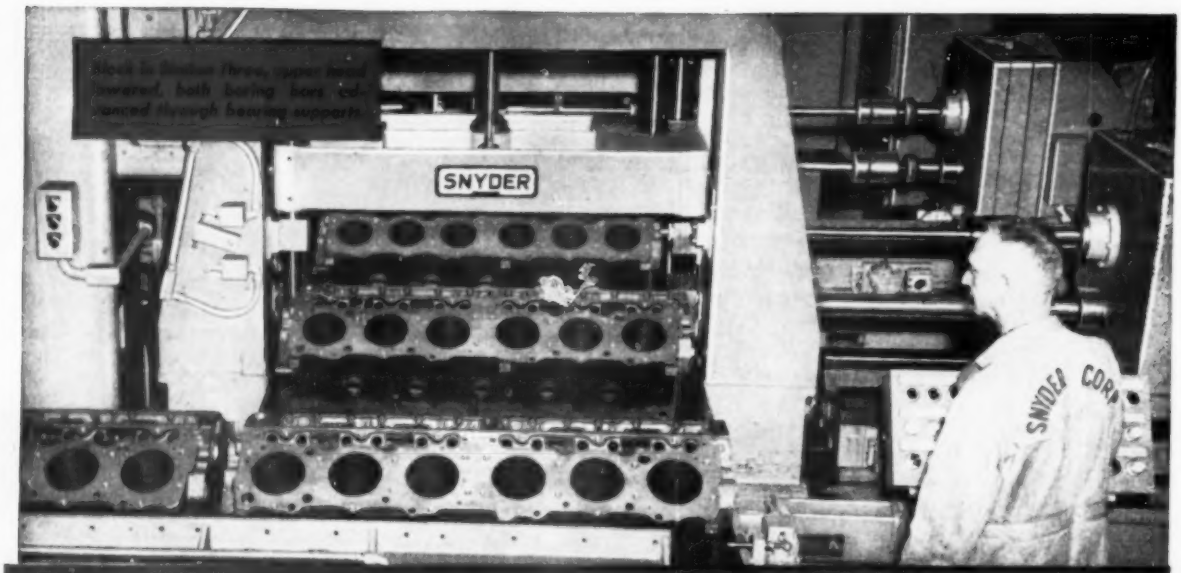
But the December survey showed declines all across the board. Sharpest drops showed up in iron and steel, petroleum, railroads, gas and electric utilities.

Looking ahead to next year, the new SEC.-Commerce Survey shows that estimated spending during the first quarter of 1960 will be 15% higher than the average for 1959—but the first quarter increase over the fourth quarter of 1959 is the smallest quarter-to-quarter increase in a year.

Manufacturing is the only business category showing a first quarter increase. Largest increase is planned by durable goods producers, especially iron and steel plants. They are scheduling a 40% increase over their depressed fourth quarter spending. Auto companies plan a 27% increase.

Import protection . . .

. . . will be denied to makers of steam turbines and steam generators by the Office of Civil and Defense Mobilization. That seems clear from a new report the Agency sent to Congress. The report gives in detail the results of the Agency's investigation into a comparable industry—hydraulic turbines and generators—which resulted in rejection of a plea for import curbs.



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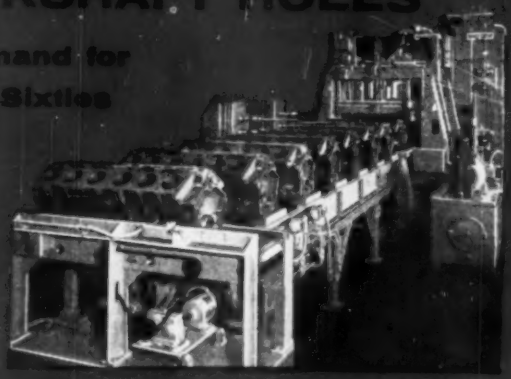
This 12-cylinder block is for heavy duty truck and marine engines aimed at taking a bigger bite of this booming market. Our Snyder special 7-station machine is helping this manufacturer SNYDERIZE for the Soaring Sixties by providing boring tolerances which make his product outstanding.

In regular production at a rate of 31 pieces per hour, main and camshaft bearing holes are rough and semi-finish bored simultaneously with all diameters held to manufacturers' specifications for alignment, roundness and concentricity. The distributor hole is also semi-finish bored in this machine to establish proper location to cam and crank bores.

Advanced engineering, both in product and production machines, is the best possible preparation for the competition of the next decade. We'll be happy to show you, too, how to SNYDERIZE for the Soaring Sixties to gain more efficient parts handling, gaging, assembly and machining. Write or phone for new brochure on machines for profit improvement.



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DETROIT...

Boom in sixties...

This is the time of year when auto company presidents don wigs and witch robes to soothsay the future. But as usual their separate recipes add up to exactly the same brew.

Chrysler Corporation President L L Colbert thinks that 1960 retail sales, including imports, will "reach and probably exceed" 7-million units, a total second only to 1955 when nearly 7.2-million cars were sold.

He is echoed by AMC's George Romney, who predicts sales of "between 7 and 7¼ million new passenger cars." Romney also revamped an earlier prediction that US-made compact cars would account for 50% of sales by 1965. "Now that the Big Three has decided to let the public decide the speed of the transition, it will be 50% sooner than that," he says.

Henry Ford II, busy launching both his new compact Comet (to the public at a cost of over $35 million) and oldest daughter Charlotte (to Detroit society at a cost of around $125,000), found time to forecast that new car sales "could exceed the 7-million mark in 1960." He looks for a 1.5-million unit truck market before the decade ends, and a 7.5-million car market should be commonplace in mid-stream.

Board Chairman Frederic Donner of GM cites sales in the "area of 7 million," including 500,000 imports. All of this crystal-ball-gazing, of course, is subject to the murky uncertainty of the steel situation.

Now and tomorrow

A sample of public opinion on the 80,000 or so Big Three compact cars now cruising U S highways in the hands of private owners shows surprisingly few bugs, considering that each of these vehicles is all-new from tires to roof.

Drivers in general are vaguely disappointed in gasoline mileage. The reason: an admittedly overenthusiastic press, testing prototypes under ideal conditions on proving grounds, obtained upwards of 40 mpg and printed these figures. But when John Doe went out in the traffic light sweepstakes, he soon noticed a realistic 17-18 mpg. Corvair, for one has never publicly claimed more than a 25-45% improvement over the standard Chevrolet six-cylinder model.

Falcon service personnel recently made a flying tour of dealers and found no chronic complaints, a happy situation attributed to the car's inherent simplicity. One problem of education involving operation of the heater is being corrected by a revision of the instructions contained in the owner's manual.

Corvair has experienced trouble with icing in its two carburetors. The simple fix, provided free by the factory, consists of adding tubes to bring hot air in from the exhaust manifold. Also, early production idler arms and pulleys had too narrow a flange, causing belt breakage. A field repair kit for this has been rushed to dealers.

In other areas Corvair is moving fast to remedy two deficiencies. A smart two-door coupe will bow at the Chicago Auto Show on January 18, giving buyers a choice of body styles that will later be augmented by a rear-engined station wagon. To answer criticism of austere trim, a package will shortly be available to dress up the belt line.

Valiant, because of the prolonged steel shortage, has produced only 10,000 units as of this writing, so it would be unfair to mention service difficulties encountered with this pilot run sampling. Its husky inclined-six engine, which produces an actual 116 hp (the advertised figure is 90), is by far the best performing of the three and has already led Corvair to introduce an optional power kit that boosts horsepower from 80 to 95. It consists of a higher lift cam, stiffer valve springs and carburetor calibration items.

Ford Motor Company too is pondering a definite shortage of horsepower in its new Comet to be introduced late this winter. The same 144-cu.-in., 90-hp six as used in the Falcon is a slowpoke inthe longer (114-inch wheelbase) heavier Comet. Engineers say that 120 hp could easily be achieved by stroking this engine 0.44 inches to give a displacement of 170 cubic inches.

Pontiac seems to be the maverick among the forthcoming B-O-P compact cars. It is ordering tooling for a 197 cu-in, in-line, water-cooled, OHV four-cylinder engine mounted in front at a 45-degree angle. Basically, it is half of the existing V-8 block. Olds and Buick versions will use the new aluminum block V-8. All of these cars will share certain elements of the Corvair body structure, mainly cowl and inner front door panels. The stretch for the longer wheelbase will be obtained by elongating the rear door area.

Dodge, meanwhile, is readying a 114-in. wheelbase, Valiant-based compact to compete with the B-O-P and Comet cars. Ford, on the other hand, is rumored to be preparing a compact compact on a 95-inch wheelbase. All makes will steadily augment available body styles throughout 1960.

How you're ahead with Danly's years-ahead design

EVEN ONE LESS DAY OF DOWNTIME PER YEAR RETURNS MORE THAN 5% OF YOUR PRESS COST

Downtime on an important production press is far more expensive than the direct maintenance costs involved. Schedules are disrupted – workers and machines stand idle—production is lost—profits suffer. Production time on a $30,000 press is very conservatively worth $30 per hour. On this basis alone, one sixteen-hour day of downtime will incur costs of $480. In a nominal 3-year payout period, one extra day of production per year can repay 5% of your press cost.

Danly presses are engineered to give you that extra day of production, *many times over*. Design innovations years ahead of the industry, and an extra measure of brawn and precision keep Danly equipment on the job month after month, without maintenance interruptions.

Outstanding case in point: the 500-ton, straight side press pictured above has been operating at the General Electric Company's Hotpoint Division Plant at Milwaukee, Wisconsin for *eleven full years* without losing a single day of scheduled production! During that time it has paused only twice for planned maintenance. Seven other Danly presses in this pressroom have equally impressive records of maintenance-free operation.

Savings in maintenance downtime alone can wipe out all price differential between quality and "economy" equipment. Still more profit will be realized from longer die life, improved parts accuracy, and other bonus benefits. For a frank and comprehensive review of these advantages, SEND FOR BULLETIN 300.

DANLY

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AIRCRAFT and MISSILES... TRENDS

No policy shifts expected . . .

The overhaul in the Pentagon's leadership is not expected to result in any important changes in defense policy during the Eisenhower administration's last term in office.

The transition to a new Defense Dept team will probably be the smoothest ever made. New Defense Secretary Gates, Air Force Secretary Douglas and Air Force Undersecretary Sharp are old hands at the Pentagon and do not present the problems posed by the appointments of men fresh to government administration and the Defense Dept.

Gates and Douglas will be able defenders of the Eisenhower defense budget, which is stabilizing military outlays for the third successive year in the face of rising costs, and is resulting in widespread cuts, stretchouts, and cancellations.

But both Gates and Douglas may find themselves in an awkward spot as top advocates of the administration's basic defense policy. Gates, who was formerly Secretary of the Navy, is on record criticizing the overemphasis on strategic nuclear forces and the inadequate effort on tactical forces to fight a limited war. Douglas, too, on occasion has boldly criticized cutbacks in Air Force spending.

To the bone...

Can a $3-million product be made for around $2 million? That's the cost-reduction goal that Republic Aviation Corp has set for production of its Thunderchief (F-105 D) jet plane. So far this let's-reduce-costs-30% program, started early last June, has been a resounding success: **As of this month,** costs have been cut 19.99%. To announce these results, and to dramatize the need for reaching the 30% goal, Republic recently invited almost 100 of its suppliers to a one-day meeting at its Farmingdale, NY, plant. Another reason for the meeting: Republic controls less than 40% of costs that go into the Thunderchief, wants its suppliers who control the remaining 60% to get in on the act.

Pointing out that the almost 20% reduction (for 95 airplanes following on to a quantity of 111 has already saved the company $25 million, E I Little (Republic's director of material) and other speakers explained how suppliers can activate programs that will bring costs down.

In just one area—equipment purchased and supplied by the government — **savings have been** 21.9% ($16.5 million), according to Little.

But, cautioned Little, only one supplier in 97 has met his cost-reduction goal. To show suppliers how to reduce expenses, speakers from Republic, the Air Force, and other cooperating companies revealed their cost-cutting techniques: value analysis, performance evaluation, inventory analysis, packaging.

One example of savings: A team, assigned to study gyros and accelerometers in the F-105 D flight-control system, cut labor costs 26% and materials costs 30%. Changes were result of improved design and manufacturing procedures.

Republic feels that its target—a 30% reduction in cost of the fiscal 1961 airplane — can be reached if suppliers and the military continue to cooperate.

Aerospace finishes . . .

Protective finishes for missiles and space vehicles are fast getting into the precious metal class—and not just gold, either.

For example, it's been suggested that a composite coating of platinum, radium and rhodium might be just the thing to protect a space vehicle against super high temperatures.

The suggestion was made in mid-December at the First Aerospace Finishing Symposium, in Dallas by Sel-Rex Corp's A Korbelak, who said that such a combination of metals would be so expensive that engineers should include on their drawings the exact areas to be coated and the price and quantity of the metal to be used. Companies have been known to lose out on bids simply for lack of such information, he said.

Vacuum deposition is one of the processes that will come in for increased use with the Space Age. According to NRC Equipment Corp's H M Farrow, the problem of molten aluminum corroding most materials has been solved with vacuum evaporation. He added that pure, dense coatings can be deposited with electron guns, and structure and grain can be closely controlled at the same time. Georgia Tech's J D Walton, Jr, told of experiments to develop arc and flame-sprayed coatings that will provide protection against oxidation and high temperatures (through insulation or emmisivity) to underlying structures.

Among other things, Walton told of an oxygen-hydrogen motor, developed at Tech, with a flame temperature of 4500 F. This plasma jet unit, he said, has raised tensile strength as much as 500 psi. A very thin coating of oil is applied before the coating is sprayed on and cooled.

Also in earospace finishing's future, according to experts at the Symposium: diffusion and interdiffusion coating of base metals, phosphoric anodization, glass-coated aluminum, and a trend from single coatings to composite coatings.

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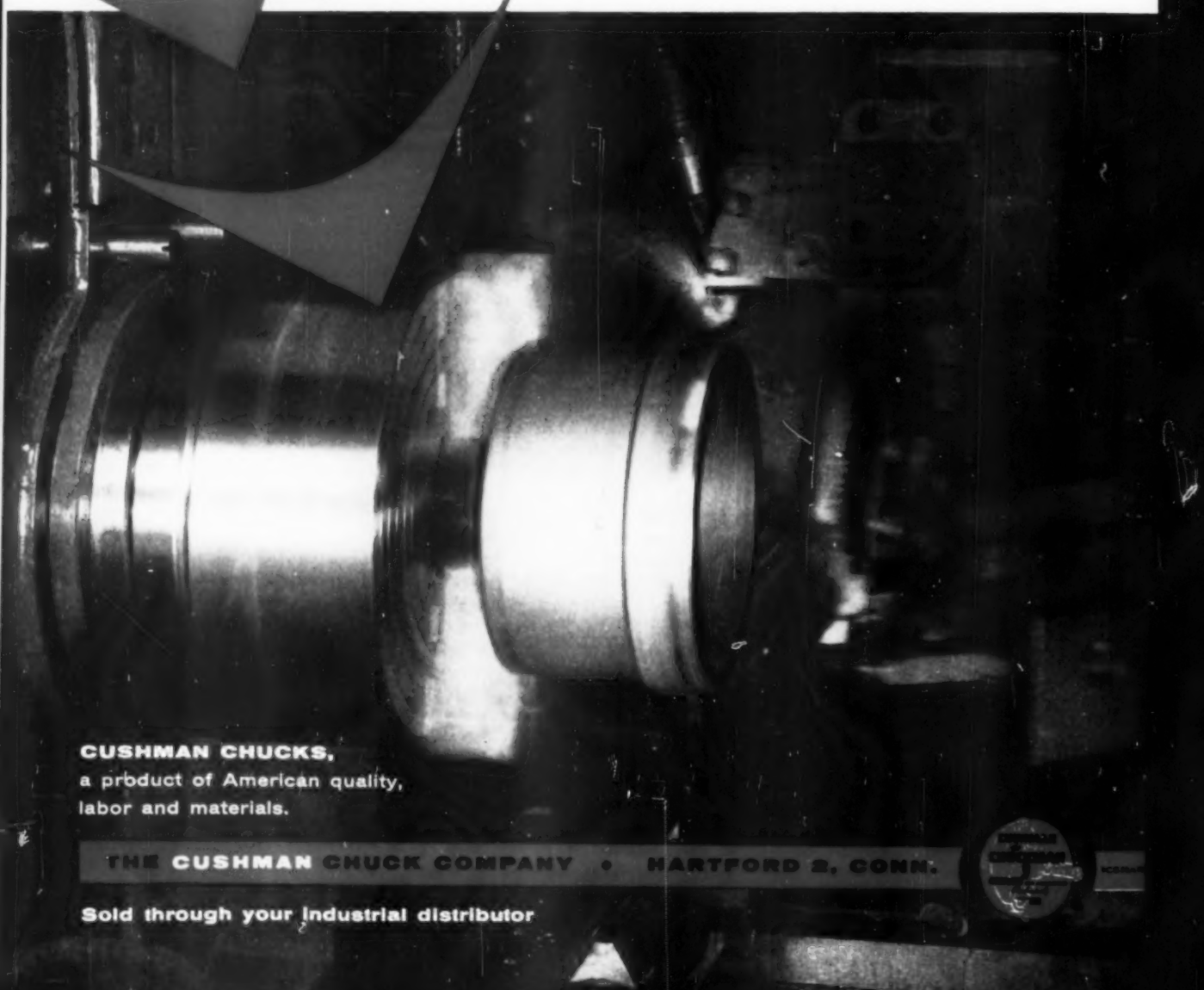

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MACHINE TOOLS...

New Orders in 1960: $850 million

Net new orders for cutting-type machine tools rose slightly in November to $44.7 million, compared with $43.6 million during October. Total bookings in the January-November period ran to $466 million. Chances are that orders for the entire year 1959 will be $500 million or higher. After a big bulge in October, to $23.5 million, as a result of European business, net new orders for forming-type machine tools fell back to $11 million in November. In the first 11 months of 1959, total orders were $136 million.

1959 orders for cutting-type and forming-type machines should be around $650 million.

Shipments of cutting-type machines added up to $361 million in the first 11 months of 1959, and of forming type machines to $110 million.

Placing of machine tool orders has been held back lately by uncertainty in steel. Builders feel that 1960 will be a good year, but the outlook won't be sharply defined until a final steel settlement is reached.

Net new orders for cutting-type and forming-type machine tools combined should be at least $850 million in the calendar year 1960.

West-to-East trade to be eased . . .

List of strategic machine tools that cannot be shipped to Russia and other Communist countries is in process of being revised in meetings of COCOM in Paris. Sessions have been in progress for some weeks and probably will be concluded in January.

Further liberalization of West-to-East trade, including machine tools, is likely to come out of this meeting. Washington is reputed to be the sole holdout against revising the rules so that almost any type of machine tool can be sold to Russia. The pressure on our government is becoming so great that changes appear inevitable.

If western European builders are permitted to ship unrestricted to Russia, U S builders are likely to be accorded the same rights.

The Russians are believed to be eager to secure from the West sizable quantities of so-called sophisticated machine tools and elephant tools.

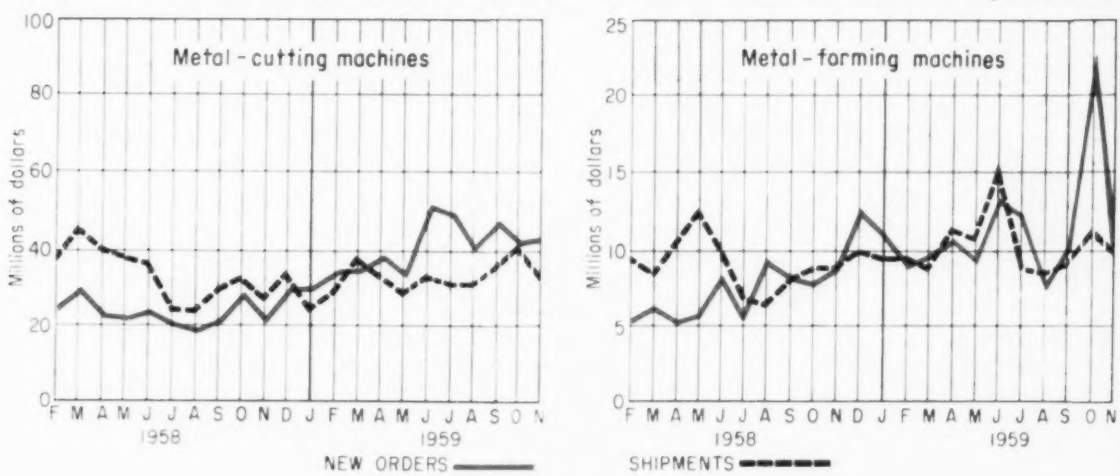
Chances are that a large ratio of total purchases in the West would be in this country if the Russians were allowed to buy machines still on the restricted list. At least several U S builders have had sales representatives visit Moscow the past year or so to estimate prospects for Russian business. The report is that the Russians are as tough traders as ever.

Whether or not the strategic list is liberalized U S builders still will have to secure export licenses from Washington before they can ship machines to Communist countries.

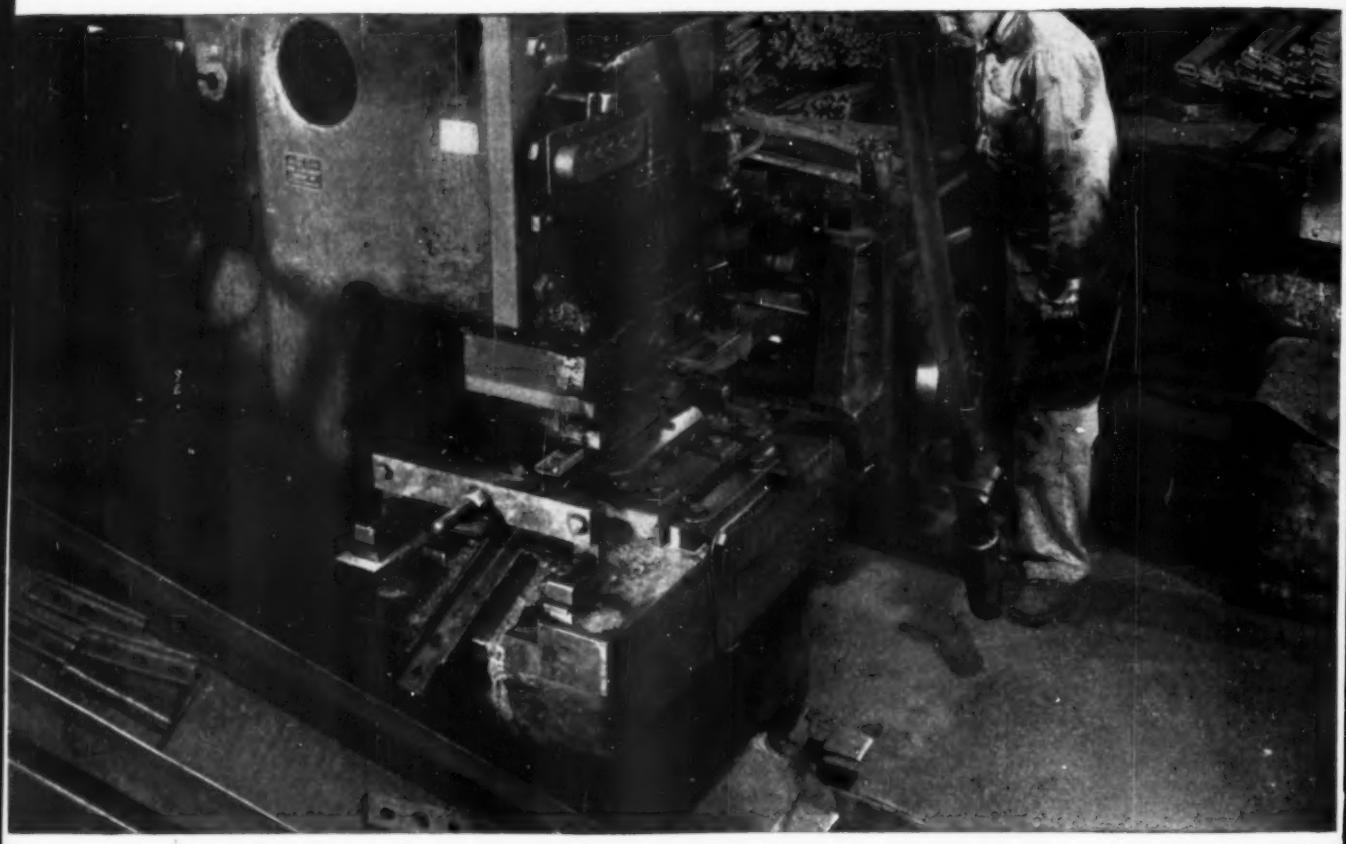
Washington seems to have a way of making the licenses hard to get for machines not on the forbidden list. Long, discouraging delays occur. And somehow license applications get buried on government desks or in desk drawers. At least that is the impression.

B.T.

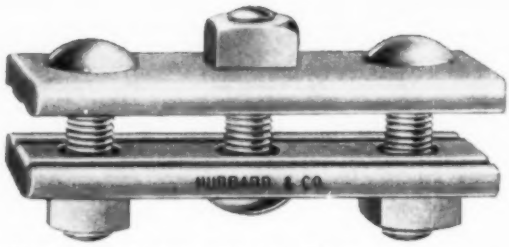
NMTBA Index of machine tool new orders and shipments



STEEL SHAPED TO CUT COSTS AND IMPROVE PRODUCTS



One automatic operation punches three holes and shears off the part from a USS Hot Rolled Special Section. No machining necessary.



Hubbard pole line hardware made from USS Special Sections.

Pole line hardware • one punch • made from USS Special Sections

Hubbard and Company is one of the largest pole line hardware manufacturers in this country. They turn out guy clamps, cable suspension clamps and lashing clamps by the thousands. To keep production costs low, they use USS Special Sections already rolled to the proper cross section for the finished piece.

Many items can be punched and sheared in one automatic operation so that there is no machining and very little scrap. Parts can then be galvanized, bolts inserted and the job completed.

How USS Special Sections can reduce your costs. If you have an irregular steel part that must be produced in quantity at low cost, let us check your drawings. Many times a complex and costly assembly can be replaced by the use of one USS Hot-Rolled Special Section. Designs are unlimited. Write for our new book showing many intricate shapes already being produced. United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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MATERIALS...

Chemicals from nuclear energy . . .

Radically new chemical processes, a result of Hercules Powder Co research, may be used to produce commercial chemical products by treatment of basic organic raw materials in a nuclear reactor. Hercules scientists have developed a design concept for a new nuclear reactor on which practical development of the new processes may be based.

As the cost of producing electrical or thermal power by nuclear reactor usually exceeds the cost by conventional methods, this could be the first peacetime application of nuclear energy capable of competing with standard manufacturing techniques. Ethylene glycol, for example, is expected to be produced in the new reactor, from menthanol, at a cost competitive with conventional glycol manufacture. Research is directed at efficient use of the fragment recoil energy of nuclear fission.

Recoil energy constitutes about 80% of the total fission energy. Normally, this energy is absorbed in the fissionable fuel and its container. In special designs of nuclear reactors using finely divided fuel, this energy is available for chemical transformation. After the chemical synthesis most of the energy is still available for electrical or thermal power generation.

All-metal Inductosyn . . .

Both rotary and linear Inductosyn data elements, supplied by Farrand Controls Inc for use in numercial and other control circuits, will be produced entirely of metal. These data elements formerly were made of "glass." The units have proved very useful but there has been some feeling that the glass elements were less than ideal in machine tools, even though housed in metal.

Conductor patterns of the all-metal scales are metallic copper 0.002 in. thick, fastened to an insulating bonding layer. Bases are of iron, steel, aluminum, titanium, etc.

Refractory-metal research . . .

Wright Air Development Center's Materials Laboratory has contracted with Harvey Aluminum to explore the basic parameters for the fabricability of refractory alloys such as the alloys of molybdenum, tungsten, niobium and tantalum. The metalworking characteristics of molybdenum and tungsten are now under study by Harvey Aluminum at WADC's metals processing facility, established to accelerate the USAF refractory alloy development program.

Harvey reports successful extrusion of 20 unalloyed molybdenum and 30 moly-alloy billets. Experimental extrusion of 50% Mo-50% tungsten and unalloyed tungsten (sinfered) has been reasonably successful at a 4:1 extrusion ratio. Molybdenum alloys extruded include Mo + 0.5% Ti, Mo + 0.5 Ti + 0.08% Zr, Mo + 1.1.5% Nb + 0.026% C, and Mo + 0.5% Zr + 0.04% C. Experience gained with these alloys offers hope that successful extrusion of the tougher molybdenum alloys will be possible.

Metals for solar energy . . .

Under a $51,000 grant by the National Science Foundation, Joseph T Gier of UCLA and Robert V Dunkle of the Berkeley campus are investigating the spectral characteristics of metal which determine how much of the sun's heat a metal will absorb, transmit or reject.

Special metal coatings and films for solar-energy equipment are also a goal of the project. Many existing materials will be tested by the two engineers. Their two-year study is a basic "first research step." If and when efficient and economic equipment is developed for controlling solar energy, its uses are virtually boundless —from space-ship propulsion to cooking, distillation and power generation throughout the world. Manufacturers of outdoor equipment also should benefit from the new knowledge acquired.

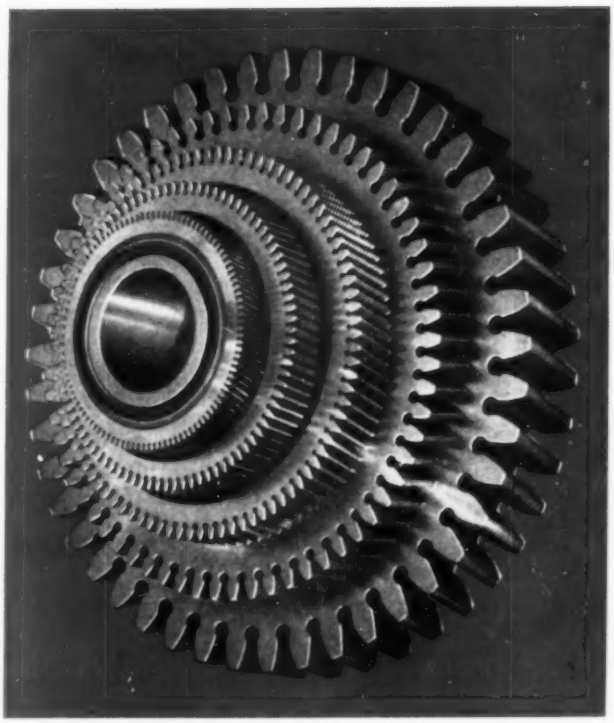
Sprayed gold . . .

Chance Vought Aircraft Inc applies more than 100 sq ft of gold plating to the inner skin of the fourth stage of NASA's "scout" research rocket. The gold plate, only 0.000010 in. thick, offers high heat reflectivity, relatively high melting point (nearly 2000 F), low spectral emissivity and exceptional corrosion resistance. It costs only 60¢ a sq ft to apply.

Electrolytic and vapor deposition methods are not practical because the parts to be plated are so large. Thus, Chance Vought went to a process used centuries ago to apply gold coatings. A gold resinate soluble in pine oil is sprayed on the part to be coated. Then the part is baked in an oven at 375 F for 15 minutes. The coating turns to pure gold in a second hour-long bake at 700 F.

Gold deposited by ionic decomposition is also applied to printed copper electrical circuits. Vought uses a 0.000002-in. thick coating on the copper to extend storage life and improve solderability by minimizing oxidation and tarnish.

WHY RED RING GEAR SHAVING CUTTERS DO SUCH AN EXCEPTIONAL JOB



- Here are some of the reasons for the accuracy, for the job performance and the long economical service life of Red Ring Shaving Cutters.
- These cutters are engineered and produced by skilled specialists who have, for the past 27 years, devoted full time to shaving cutters, exclusively. Never underestimate this vast fund of experience which is unmatched anywhere else in the field.
- All Red Ring cutter grinding and cutter inspections are carried on in temperature controlled departments, for maximum precision. Where else is this done?
- Every Red Ring Cutter is made from a controlled specification forging—proper grain flow and uniform distribution of carbides in the tooth zone.
- Every Red Ring Cutter is heat treated in Red Ring furnaces under the direct control of Red Ring metallurgists.
- Every new cutter design is given a thorough performance try out in the Red Ring Gear Laboratory before it is released.
- Red Ring cutter engineers and service specialists are always available for consultation and to help a cutter customer in an emergency.

When you buy cutters, take advantage of these extra benefits. There is no extra cost.

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WHAT'S AHEAD... in Metalworking

TRENDS

Into 1960 With Fingers Crossed...

Metalworking production (see chart below) is continuing under wraps as 1959 ends. Steel shortages are responsible, of course.

Even if the steel strike is finally settled next month (and it's expected it will be), it will take some time for metalworking production to get back to the record highs it achieved before the strike. But in spite of anticipated early-in-the-year setbacks, metalworking in 1960 is expected to achieve record peacetime highs.

Virtually all segments of metalworking are looking forward to a banner year. The two biggest consumer industries—automobiles and appliances—anticipate a great year in 1960, with autos expecting a long-awaited sales lift, and appliances a continuation of record sales.

Major appliance sales and production should run just a little ahead of 1959—maybe 4 to 5% in most lines. An exceptionally good outlook is foreseen for color TV (a jump of 40 to 50%), black and white TV (10% or more), and radios (5% or more).

Sales of farm machinery may equal those for 1959, but it must be remembered that '59 was the first really good year this industry has racked up in a long time. Demand for farm equipment is still high but 1959's drop of 15% in net farm income is expected to show up in 1960 buying.

Construction machinery demand, on the other hand, should show a slight increase in 1960, largely because of increasing orders from abroad. Production will stay high throughout the year, however, as makers fulfill backlogs.

Makers of railroad cars expect a terrific upsurge of business in 1960 after a long, long period of doldrums—maybe as much as a 50% increase.

Makers of automotive parts, along with their parent industry, are "extremely optimistic" over prospects for next year. Not only do they anticipate a boom year in original equipment parts for new cars, they say that replacement part inventories are about a fifth of what they should be because of the steel strike and parts makers' plants will be kept going full blast filling pipelines. Truck parts production will boom, too.

On the basic metalworking side, foundries look forward to a really good year. Steel founders predict a 1.7-million-ton year, and that's only 250,000 tons short of record 1956.

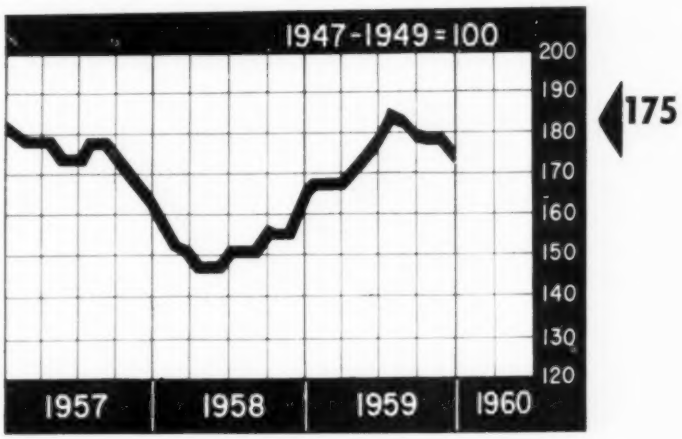
Gray iron founders, now operating somewhere around 90% of maximum demand, expect at least a 10% increase in the coming year.

Nonferrous foundries, which experienced a post-recession pickup last spring, were later hard hit by secondary effects of the steel strike. But 1960 looks like a good year for the industry.

Meanwhile on the steel cold war front, mills are producing and shipping at near capacity and making a desperate effort to see that there is something for everyone.

Buyers are reportedly jamming hotels in cities around the big steel-producing centers in an effort to corral steel for their firms. In hottest demand are structurals and cold-rolled sheet. Most of the latter is reportedly earmarked for the automotive industry.

But at year's end metalworking firms across the country were keeping their corporate fingers crossed against a possibility of a resumption of the steel strike—knowing full well that another strike would mean immediate layoffs and a real roadblock on the climb to new production highs.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

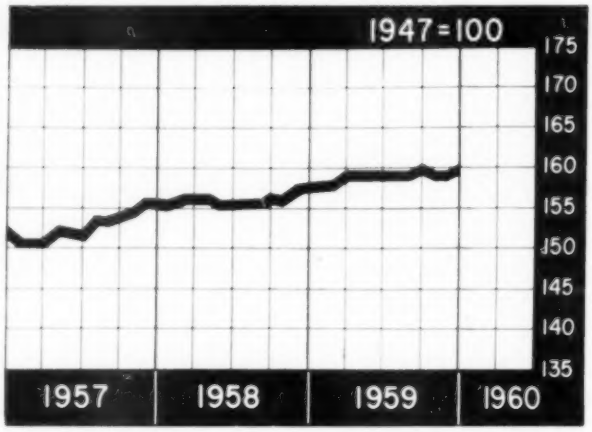
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	DEC Estimated	NOV Preliminary	OCT Revised	NOV Year Ago
Total Index	**175**	**174**	**181**	**163**
Machinery	154	155	133	
Electrical Machinery	218	232	182	
Autos	91	132	145	
Other Transportation	330	333	310	
Other Metalworking	148	150	143	

TRENDS WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	DEC. Estimated	NOV. Preliminary	OCT. Revised	NOV. Year Ago
Total Index	**159.6**	**159.6**	**159.5**	**157.5**
Metalworking Machinery	...	188.9	188.6	181.6
Other Machinery exc. Electrical	.	171.9	171.7	167.8
Electrical Machinery	...	162.4	162.4	162.4
Fabricated Metal Products	.....	148.3	148.3	148.3



Output of durables will bounce back ...

You should see a sharp increase in output of durable goods in the months ahead. Shortages of steel cut production of major durable goods in the final weeks of the strike. Output of major consumer durables fell by more than 25% in November; production of automobiles was cut by more than 50%. But demand for both consumer durables and producers' goods is strong, and it will spark a rapid recovery in the durable goods industries.

Consumer credit buying still on the upswing. And consumers will be buying big ticket items such as cars and TV sets as long as they feel they are able to meet instalment payments. Timed with the debut of new car models, consumer credit outstanding rose by more than $500 million in October. Instalment buying has been reduced more recently by shortages of new cars. But it is certain to pickup again as auto dealers restock their showrooms. Incomes will begin to climb as industrial production gets back into high gear. And growing incomes will keep consumers in a mood for buying cars and other major durables.

Output of producers' goods will also climb in the months ahead, as capital spending rises.

The latest Commerce Department quarterly survey of business capital spending plans indicates that spending for plant and equipment will increase substantially in the first quarter of 1960. Spending slated for the first three months of the year is 15% above '59's rate.

Spending for inventories will also boost output of capital goods. Inventories of durable goods in the hands of manufacturers declined by another $600 million during October. Bright sales prospects indicated in the recent McGraw-Hill survey call for replenishing stocks of durable goods.

Another rise in new orders for durable goods in October supports the bright outlook for the durable goods industries.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	156.9	155.1	145.0
Steel ingot operation (thousands of tons)	2729	2732	2011
Electric power output (million Kilowatt hours)	14,167	13,907	13,450
Production of automobiles and trucks	85,638	55,337	137,882
Engineering construction awards (Eng. News-Record-millions)	$313.8	$293.7	$291.8
MONTHLY BUSINESS INDICATORS	**Latest Month**	**Preceding Month**	**Year Ago**
Index of industrial production (1947-1949=100)*	148	147	141
Index of durable manufacturers production (1947-1949=100)*	156	156	151
Durable goods manufacturers' sales, millions*	$13,949	$14,113	$19,943
Machinery manufacturers' sales, millions*	$ 4,620	$ 4,663	$ 3,993
Durable goods manufacturers' new orders, million	$14,908	$14,747	$13,530
Machinery manufacturers' new orders, millions	$ 4,973	$ 5,067	$ 3,975
New Orders for Nonelectrical Machinery (1950=100)*	172	183	152
New Contracts for Industrial Construction (1950=100)*	171	171	61

*Seasonally adjusted

CIRCLE 206 READER SERVICE CARD ►

Lightning fast speed change

a money making virtue!

This time saving feature of "AMERICAN" Pacemaker Lathes appeals strongly to operators who acclaim it a real money maker for them.

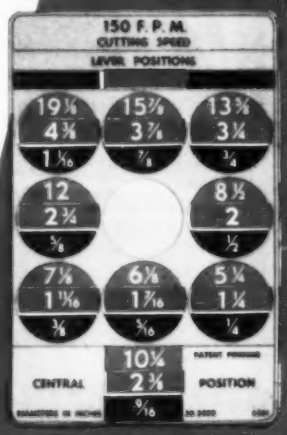
The speed plate is direct reading and shows at a glance the available spindle speeds and how to secure them. Operators can't go wrong. So fast, so easy to read and so simple that they do not hesitate to make speed changes to secure correct cutting speeds.

In addition, cutting speed snap-on plates are available indicating the lever positions for cutting various work diameters at the selected feet per minute cutting speed. These plates may be quickly applied and changed for the desired cutting speed.

No system for securing cutting speeds could be simpler, faster or less expensive in first cost and maintenance.

- *These and other fine features of the "AMERICAN" DeLuxe Model Pacemaker are illustrated and described by Bulletin No. 116.*

Spindle Speed Plate (Direct Reading)

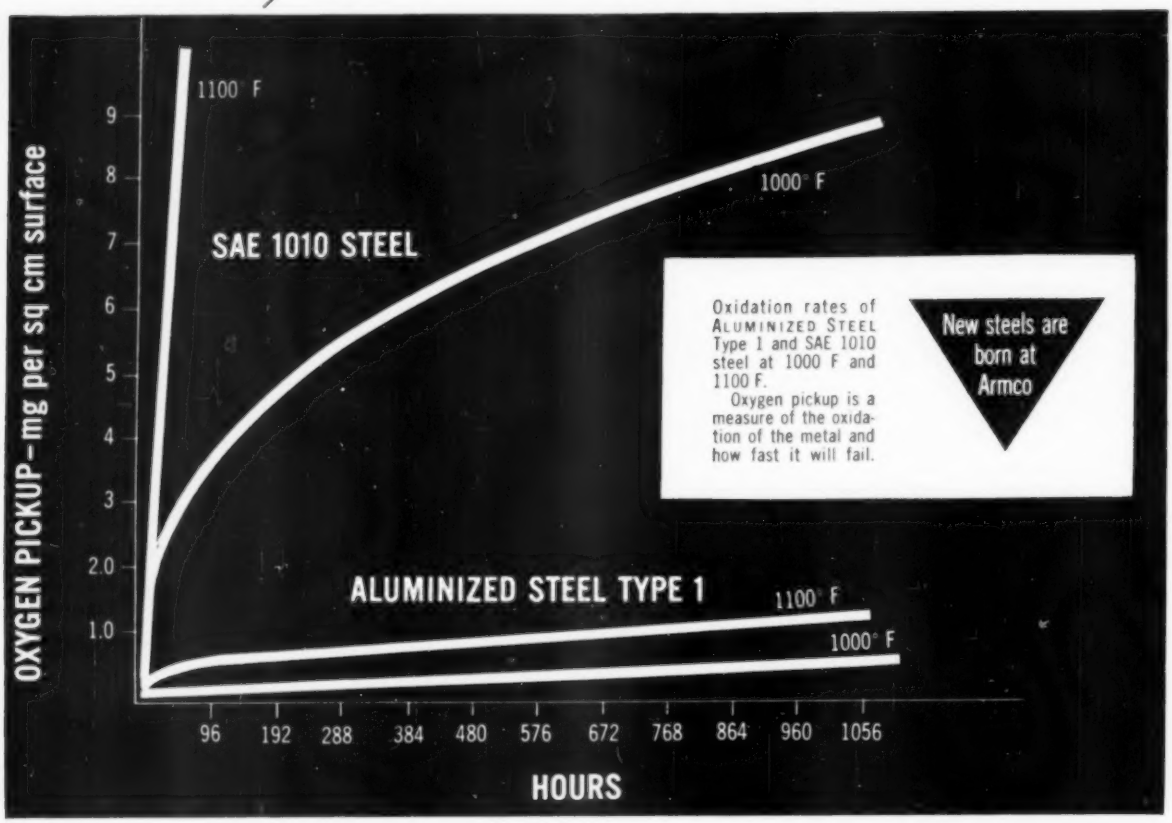


Cutting Speed Plate (Direct Reading)

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

ARMCO STEELS / for better products • lower costs



Research Data Shows Why Armco's Special Aluminum-Coated Steel Withstands Heat

Comparative oxidation rates indicate remarkable durability of corrosion-resistant Armco ALUMINIZED STEEL Type 1 at high temperatures.

Oxidation rates of ALUMINIZED STEEL Type 1 at 1000 and 1100 F compared with those of SAE 1010 steel demonstrate why this special Armco Steel has become a popular material for parts that must resist heat.

The hot-dip aluminum coating applied by a special Armco-developed process prevents oxygen from destructively scaling the base metal at temperatures up to about 1250 F. In addition, ALUMINIZED STEEL also provides good corrosion resistance. This unique combination of steel and aluminum withstands the corrosive attack of combustion products and condensates.

Because ALUMINIZED STEEL Type 1 combats both heat and corrosion and because its steel base gives parts high strength, it can be used in thinner gages and at higher temperatures than other metals.

For these reasons, Armco's special aluminum-coated steel has proved to be the most economical and durable metal for auto mufflers, heat exchangers, combustion chambers, industrial ovens, appliances, and similar products requiring resistance to heat and corrosion. Put the cost-cutting, performance-improving advantages of Armco ALUMINIZED STEEL Type 1 to work in your products. Write us for complete information. Armco Steel Corporation, 3249 Curtis Street, Middletown, Ohio.

ARMCO STEEL

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation

American Machinist

THE MAGAZINE OF METALWORKING MANUFACTURING • ESTABLISHED 1877

It's the American Way, You Know

Being full of Christmas cheer and high resolutions, we feel a compulsion to pass along to you, free of charge, comments on things around us.

As long as we can remember, we have heard about our vaunted American efficiency. Well, we sure would like to see some of it in action, because it is sadly lacking in a lot of places.

It took Railway Express exactly two weeks to get a package from a New York City dock to our home 25 miles away. A New York department store delivered some purchases to us 10 days after they were bought, and thought nothing of it. Not to mention the fact that a glass dish, poorly packed, arrived broken.

We bought a record album . . .

of a sell-out Broadway musical, played it at home and promptly returned it because it had two defects on one side.

The other day we had to go across town to a meeting. To avoid heavy traffic congestion, we shunned a taxi and went down to the subway. So we waited and waited on the subway platform for a train. Why such slow service? Every year or so the Transport Workers' Union has a big row with the New York Transport Authority and emerges with a higher hourly wage. The result is that the fare has gone up, services have been cut, fewer people ride the subways and the public suffers.

We did some Christmas shopping and found that conditions have not changed much. You were lucky to find a clerk to wait on you. And most of them acted as though they were doing you a favor. Their ignorance of the store's merchandise was abysmal.

Sounds as though all the inefficiency is in the retail and service trades. We regretfully report that it isn't. American industry, including Metalworking, has its share of it too.

Have you bought a new car . . .

lately? You certainly know then about the special dollar allowance to dealers to fix up what was wrong with your car when it left the factory. And just remember that the dealer would like to keep all of the allowance for himself unless you have the fortitude to insist upon his remedying the defects in your new car.

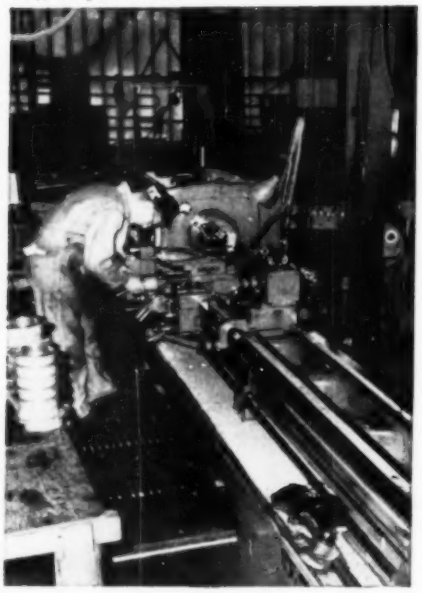
There are many other things that we could mention, such as prevalence of feather-bedding in various industries and trades, or the fact that it normally takes two or three days for a first-class letter to be delivered from one New York City suburb to another (in England you can mail a letter from a London suburb or the remotest spot in the entire country and it will be delivered in London the next day).

But if we keep up this recital . . .

much longer, you will somehow get the idea that we are voicing a bitter complaint. And we really are not upset at all. We are reasonably relaxed and accept the situation as a part of the American way of life. Or should we?

Burnham Finney EDITOR

Here, a slip joint collar is being turned and bored from a T-6 aluminum blank. Floor-to-floor time is only 25 minutes, a 30% saving in time alone.



even an engine lathe can have an impressive record of savings if it's a LODGE & SHIPLEY POWERTURN

records show $2000.00 annual saving . . . 30% on a typical operation

Significant savings are nothing new on production type lathes but it is something to write home about on an engine lathe. Tacoma Boatbuilding Co., Inc., Tacoma, Washington, liked the accuracy, versatility and output of their POWERTURN Lathe . . . found impressive savings even when this engine lathe was used for non-repetitive operations.

Whatever your turning requirements, consider Lodge & Shipley. Your needs can be filled precisely from a complete range of sizes and types . . . Production, Engine, Toolmaker, Gap, Hydraulic Tracer Controlled and Right Angle Chucking Lathes . . . all designed to provide the best machine for a specific job.

Check Sweet's Machine Tool File, your telephone book Yellow Pages or write direct for literature: **The Lodge & Shipley Company, 3056 Colerain Ave., Cincinnati 25, Ohio.**

Your Lodge-ical choice . . .

Lodge & Shipley

Now developed from Taylor's basic formula:

A shortcut to determine machinability

With a few short cutting tests and this mathematical approach, it may be possible to solve machinability problems in a fraction of the time needed for complete tool life testing

By Anderson Ashburn, managing editor

Major savings in time in the plotting of cutting speed to tool life relationships may be possible with a new shortcut proposed by the Metal Removal Center at Spring Garden Institute, Philadelphia.

With improvements in cutting tools, making a complete set of tests under varying conditions of feed, depth of cut, coolant, and tool material for a given work material has become too time-consuming and too expensive in terms of stock consumed.

In a shortcut devised by Gordon Urquhart, staff engineer at the Metal Removal Center, and tested jointly with Robert Campbell, project engineer, conditions can be established that make the cutting tests relatively short. The results of these tests are then extended mathematically to cover the desired conditions.

An even more extensive study to check the validity of the new method has been undertaken by Dr Horace Frommelt, director of the Center, in cooperation with International Business Machines. This pilot study will also serve to indicate the degree to which it may be practical to develop speed and feed tables by computer based on limited initial tool life tests.*

Taylor's Basic Work

The relationship between cutting speed and tool life was established by Frederick W Taylor in the equation:

$$VT^n = C$$

where V = cutting edge velocity in surface feet per minute

T = tool life in minutes

n = an exponent determined experimentally

C = a constant

If T is 1, then the equation would become V = C and it is thus determined that the constant is equal to the velocity that will give a cutting life of one minute.

When the Taylor curve is plotted on log-log paper it is a straight line and the exponent n is the slope of this curve.

"Tool life" was originally defined as complete failure of the tool. Thus Taylor's famous 20-minute tool life tests were based on cutting speeds sufficient to cause complete failure of the tool in exactly 20 min.

With the advent of carbide tools, the complete-failure concept became unwieldy. Various methods of shortening tool life tests were proposed, with the measurement of the flank wear land probably gaining the most general acceptance. Today a flank wear land of 0.030 in. is commonly accepted as representing the "life" of a carbide tool. Normally, carbide tools should be reground at this point, unless workpiece finish requirements call for a shorter tool life.

Urquhart's First Step

In practice, it is not easy to stop a cut at the precise time at which the desired wear land is achieved. Therefore, it is necessary to make runs at several cutting speeds for each set of conditions to be checked. For each cutting speed a series of measurements is made of the wear land at selected time intervals. The amount of wear is plotted against time and the curve is drawn through these points (see Fig. 1). From the curves thus established it is possible to read the points required for plotting a speed-tool life curve for the desired 0.030 in. flank wear land.

In making a mathematical approach to this problem, Gordon Urquhart has established a relationship for the values of C for corresponding values of flank wear land. If this is done, it is possible to determine C for a flank wear of 0.005 in. (a much shorter test than 0.030 in.) and then compute the value for C at 0.030 in. This is done with the equation:

$$C = C_B \left(\frac{FW_c}{FW_B} \right)^k$$

where,

C = the C value to be determined by calculation for the wear land selected to determine tool life (such as 0.030 in.)

C_B = the C value obtained experimentally from a small wear land and used as a base (such as 0.005 in.)

FW_c = the wear land selected to measure tool life

FW_B = the wear land used to determine C_B

k = an exponent applicable for the conditions in the test. It is numerically equal to the log of the ratio of any two values of C divided by the log of the

*The Spring Garden Institute-IBM joint study was initiated by Dr Frommelt at the suggestion of an editor of American Machinist.

ratio of the corresponding values of wear land from which the C values were obtained.

The key step in the new method then becomes the calculation of the exponent k. To do this, conventional test procedure is followed for several cutting velocities to determine the time required for flank wear of, say, 0.005 in. and 0.007 in. When these two curves are plotted on log-log paper they should be straight lines and they should be parallel. (This will establish the slope n of the curve for the conditions chosen.) If we call these two curves x and y respectively, and read the cutting velocities for a tool life of one minute we will have the C values x and y for flank wear of x and y. The exponent k can now be calculated:

$$k = \frac{\log\left(\frac{C_y}{C_x}\right)}{\log\left(\frac{FW_y}{FW_x}\right)}$$

Once k has been calculated, either of the C values used to determine k can then be used to compute the C value for the desired flank wear land.

Here is an example to demonstrate how this works. It is from one of the early tests of the method made by Urquhart and Campbell. The material was 81.5 iron, 18.5 copper, the tool was K4H carbide, and feed was 0.005 ipr. The depth of cut was not reported, but was the same throughout the test.

From a plot of speed and tool life at 0.005 and 0.007 in. wear lands, the C values (velocity for a cutting life of 1 min) were read at 1175 and 1300. Then:

$$k = \frac{\log\left(\frac{C_y}{C_x}\right)}{\log\left(\frac{FW_y}{FW_x}\right)} = \frac{\log\left(\frac{1300}{1175}\right)}{\log\left(\frac{0.007}{0.005}\right)} = 0.30$$

With the value of the exponent k thus established, you can compute the value of C from the experimental data on a 0.005 wear land:

$$C = C_B\left(\frac{FW_C}{FW_B}\right)^k = 1175\left(\frac{0.030}{0.005}\right)^{0.30} = 2012$$

If you prefer, you can compute the value of C from the experimental data for the 0.007 wear land:

$$C = 1300\left(\frac{0.030}{0.007}\right)^{0.30} = 2012$$

Identical C values were obtained from these two calculations because these were the two experimental bases used to calculate the value of the exponent k. If the calculated values are compared with experimental data at other amounts of flank wear, some variation is to be expected.

The calculations shown above can be made in a few seconds on a log-log slide rule. Using the calculated value C = 2012, and the slope n that was established by either of the two sets of experimental data, you can now draw a cutting speed-tool life curve for a life of 0.030 flank wear.

The time required for this procedure (including the required experimental data) is variously estimated at 10 to 25% of the time required to make the curve by experimental data alone.

If it is desirable to use some flank wear other than 0.030 in., the same procedure can be followed ,nd the same k value would be used. It is not even necessary to plot the curve. With the value of C established, the cutting speed required to give the desired tool life can be calculated:

$$V = \frac{C}{T^n}$$

Here is a more complete set of test data that demonstrates the close correlation. Data from the actual test runs on SAE 4340:

Flank Wear Land	Value of C
0.005	750
0.006	810
0.009	940
0.010	990
0.022	1350

From this test data the value of k was calculated from the 0.005 and 0.010-in. wear lands and corresponding C values:

$$k = \frac{\log\left(\frac{990}{750}\right)}{\log\left(\frac{0.010}{0.005}\right)} = 0.40$$

Then calculated values of C can be made from any of the test values of C above. Listed below, for comparison, are the resulting C values from the 0.005-in. and 0.022-in. flank wear lands:

		C Calculated	
Wear	C Test	0.005	0.022
0.005	750	750	747
0.006	810	807	802
0.009	940	948	945
0.010	990	990	986
0.022	1350	1358	1350
0.030	—	1538	1532

Derivation of the Formula

The following explanation has been offered for the derivation of the formula for the calculated value of C. The flank wear land is a function of such variables as depth of cut d, feed f, work material m, cutting element e, time t, cutting velocity v, etc.

Using the form of dimensional analysis and equating with a suitable coefficient w, we have:

$FW = w\ (d)^a\ (f)^b\ (m)^c\ (e)^d\ (t)^f\ (v)^g$ etc.

Because the value of C is the value of V for a tool life T of one minute, the equation can be rewritten for flank wear land x:

$FW_x = w\ (d)^a\ (f)^b\ (m)^c\ (e)^d\ (1)\ (C_x)^g$ etc.

Now if we hold all variables constant except the flank wear land, we can write the equation in this form for a flank wear land of y:

$FW_y = w\ (d)^a\ (f)^b\ (m)^c\ (e)^d\ (1)\ (C_y)^g$ etc.

Now we can divide the equation for y wear by the one for x wear:

$$\frac{FW_y}{FW_x} = \frac{w\ (d)^a\ (f)^b\ (m)^c\ (e)^d\ (1)\ (C_y)^g \text{ etc.}}{w\ (d)^a\ (f)^b\ (m)^c\ (e)^d\ (1)\ (C_x)^g \text{ etc.}} = \frac{(C_y)^g}{(C_x)^g} = \left(\frac{C_y}{C_x}\right)^g$$

Raising each side of the equation to the power 1/g, we have:

$$\left(\frac{FW_y}{FW_x}\right)^{\frac{1}{g}} = \frac{C_y}{C_x}$$

If we designate 1/g by k:

$$\frac{C_y}{C_x} = \left(\frac{FW_y}{FW_x}\right)^k \quad \text{or} \quad (C_y = C_x\left(\frac{FW_y}{FW_x}\right)^k$$

which is the equation used in the calculations discussed earlier.

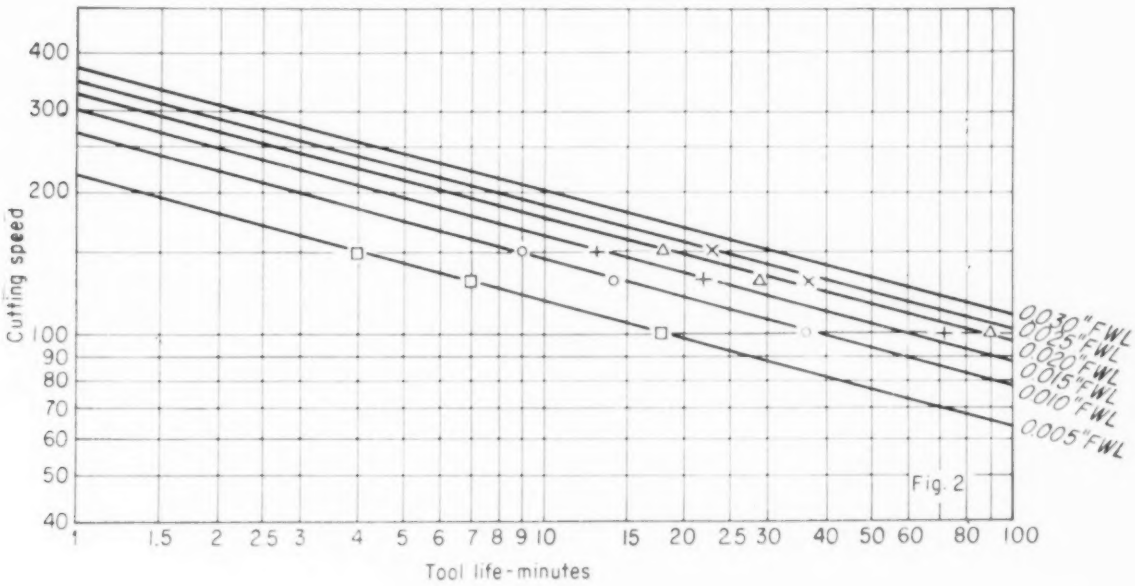
The Second Step

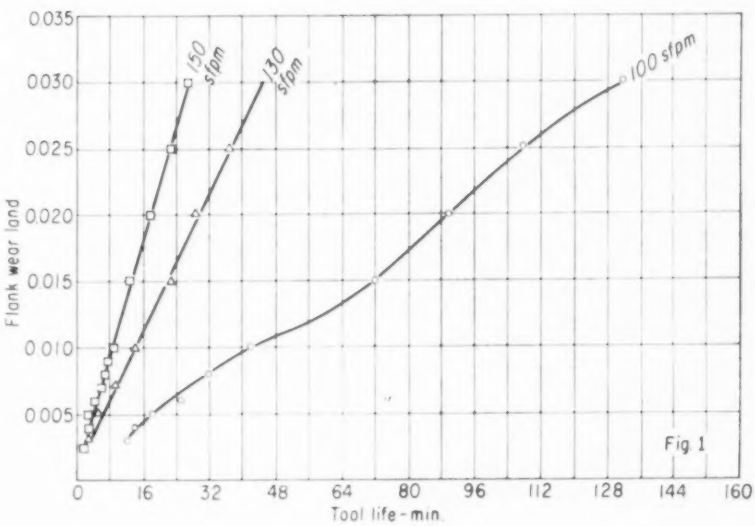
In all this discussion, the relationship has been kept simple by making no changes in cutting tool, work material, feed, depth of cut, or other factors. Gordon Ur-

quhart is convinced, and so are the others who have worked with the project at Spring Garden Institute, that the same method can be applied to other variables in the cutting operation within the range to which the basic Taylor formula applies. The method probably will not apply at very low or ultra-high speeds, or at the extremes of the other variables.

The cutting tests now being made are for the purpose of finding out how well the method can be extended. A series of 420 sets of tests on SAE 4340 is being made with varying feed, depth of cut, and speed. Based on part of the tests, calculations by computer will be made to arrive at C and n values for the other conditions, and the computed values will be checked for correlation with the test results.

The test runs should be completed next month and some idea of the value of the method can be determined soon after that. If the study shows good correlation then we will indeed have a shortcut method to determine machinability.





Machinability of 302 Stainless

Experimental and calculated results on Type 302 stainless steel at 200 Bhn. The tool was K4H carbide, with 5° negative rakes, 15° cutting edge angles, and 1/32-in. nose radius. Fig. 1 shows experimental data at three speeds plotted with flank wear land against tool life on Cartesian coordinates. Fig. 2 shows various degrees of flank wear land plotted on log-log coordinates with cutting speed against tool life. The curves drawn in Fig. 2 are the calculated curves for the respective flank wear lands. Calculations are as follows:

$$k = \frac{\log \frac{350}{300}}{\log \frac{25}{15}} = \frac{0.1525}{0.51} = 0.3$$

Calculations of C based on the 0.015-in. wear land are:

at 0.005, $C = 300 \left(\frac{0.005}{0.015}\right)^{0.3} = 216$

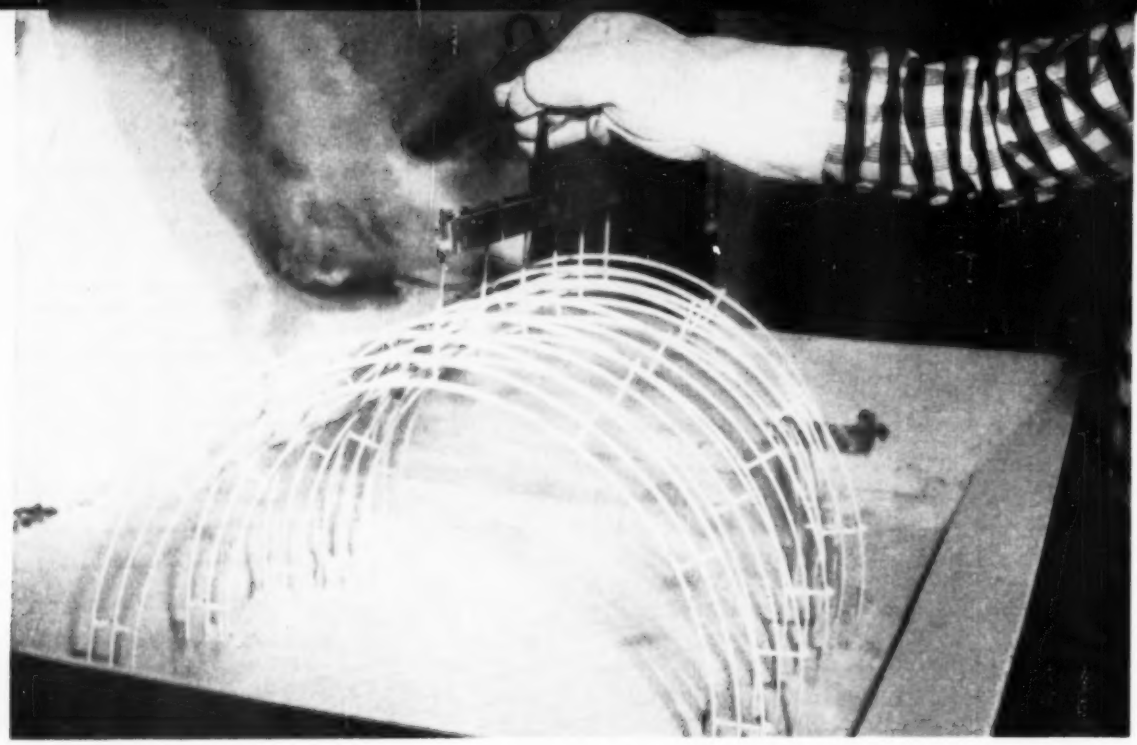
0.010, $C = 300 \left(\frac{0.010}{0.015}\right)^{0.3} = 266$

0.015, $C = 300 \left(\frac{0.015}{0.015}\right)^{0.3} = 300$

0.020, $C = 300 \left(\frac{0.020}{0.015}\right)^{0.3} = 327$

0.025, $C = 300 \left(\frac{0.025}{0.015}\right)^{0.3} = 350$

0.030, $C = 300 \left(\frac{0.030}{0.015}\right)^{0.3} = 369$



Fluidized bed . . .
of vinyl powder is contained in a tank and resembles a foamy liquid. Parts are immersed in the material and agitated to assure contact between the suspended particles and all portions of the pre-heated part surface. A single dip applies a 10-mil-thick coating of smooth Corvel vinyl powder in a few seconds. Multiple dipping is not necessary.

Fluidized bed . . .

A new manufacturing tool

When finely powdered materials — such as metals, plastics or ceramics — are placed in a tank and churned into a rolling, flowing, liquid-like condition by compressed air, or other gases, the suspended particles form a "fluidized bed." In this "bath" parts can be coated to provide new finishes. Similarly, mandrels and patterns can be coated, then removed from the coating to form hollow, intricate shapes. The process offers speed plus ability to use materials not otherwise applicable. Here is one example.

By William M Stocker, Jr
senior associate editor

For coating, and some forms of fabrication, the fluidized-bed process offers a valuable new manufacturing tool. Because the process is dry, requiring no materials in solution and no electric current, it can perform jobs previously impractical or impossible. The process is particularly useful for coating intricate shapes and for applying insoluble materials. It can also be used to apply multi-material coatings and to form thin-walled parts, using a mandrel or a mold.

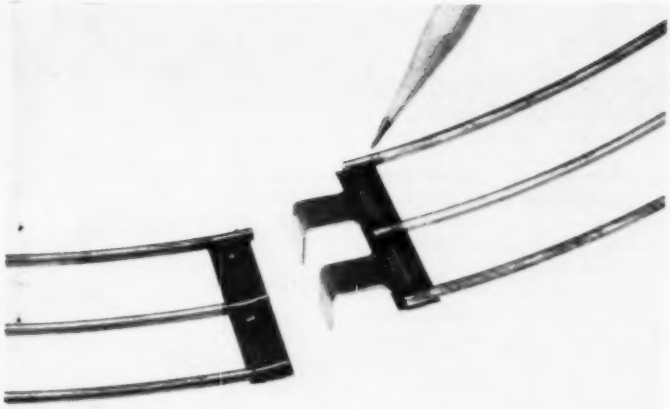
Most important is the concept of a finely powdered material being given the characteristics of a fluid by pushing air or gas through it. One caution: Some fine powders are explosive in air or oxygen. It is safer to apply the process under the direction of trained people. For instance, nitrogen can be used in place of air. However, with most industrial coatings there is no problem. Coatings can be applied for insulation, decoration, corrosion resistance, etc.

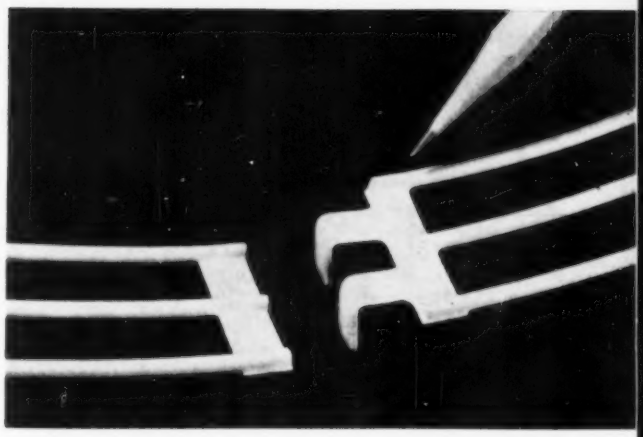
Polymer Processes, Inc, a subsidiary of The Polymer Corp, Reading, Pa, licenses manufacturers to use the fluidized-bed process for the application of plastic surfaces to metal parts. Bauer Brothers Co, Springfield, Ohio, a wire-products fabricator and a licensee, uses the process to manufacture a clothes guard for a washing machine.

Frequently, a welded-wire part of this kind is fabricated in one plant and finished in another. Bauer Brothers Co submitted a quotation for the complete, ready-to-use part. The first saving was elimination of double handling. Further savings accrued by eliminating deburring and grinding after welding, by being able to use bright basic wire instead of extra-clean and bright wire needed for plating ($^3/_4$¢ per lb higher price), and by conserving material.

Bauer Brothers designed a dual merry-go-round fixture to resistance weld the guard automatically. Triple-ring guard uses 13-gage 0.091-in.-dia and 14-gage 0.080-in.dia bright-steel wire, cross welded every 30 degrees with the same weight wire. Alternate cross-wiresare trimmed flush. Untrimmed wires are formed into mounting hooks.

While one turntable is being unloaded and reloaded, the other indexes twelve times and completes 39 resistance welds. Eleven cross-wires and two end tabs are welded across the three circles of wire. Trimming and forming operations on





Metal end clips . . .
as they appear after welding and after coating. No grinding or deburring is necessary on welded joints because they will be thoroughly covered by vinyl. There is no pull-back from the sharp, unburred edges of the stamped metal end clips

the cross-wires make the part ready for coating. Grinding and deburring are eliminated as sharp edges and weld flash will be thoroughly covered by vinyl.

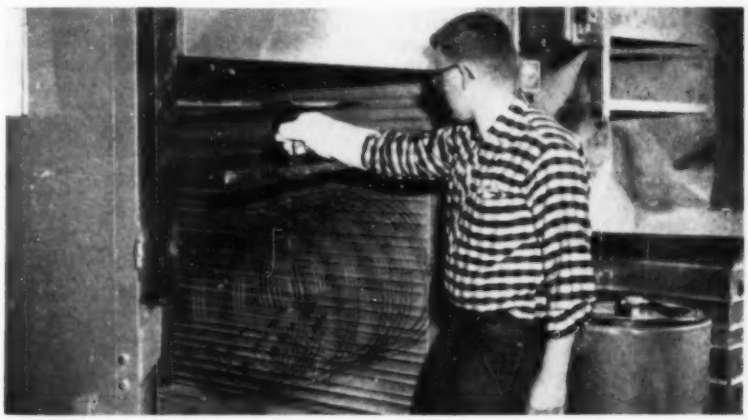
The wire loops are ganged, 6-up, on a hanger and conveyorized through two dipping tanks to remove any trace of grease or dirt. After thorough cleaning and drying, the part is ready to accept the vinyl.

Coatings are applied by the fluidized-bed process in which the object to be clad is preheated above the melting point of the plastic coating material. The part is then immersed and moved to and fro in a fluidized bed of dry, finely-divided, specially prepared powders, called Corvel powders. The powder is kept in motion—fluidized—by a controlled current of air or gas within a tank designed for the process.

A uniform coating is deposited on even the most complex shapes. As individual particles of the fluidized plastic contact the heated surface, they melt and adhere to the surface. Coating thickness is controlled by the residual heat of the part and length of time in the fluidized bed.

Postheating the coated part above the melting point of the resin thoroughly fuses all of the particles on the surface. Plastic powder particles thus form a continuous coating of uniform thickness, unmarred by sags, drips or bridging.

Bauer Brothers coats the clothes guard with a light-blue vinyl. The standard temperature range for coating this vinyl is from 375 to 550F, depending on the part to be coated and the desired thickness of coating. The wire used for the clothes guard has little mass to retain heat between the forced-air, preheat oven and the dipping tank. To counteract this rapid heat loss, the part is preheated to a temperature of 500F.



Guards are preheated . . .
to 500F in a 50 x 50 in. electric forced-air circulating oven prior to coating. (Fluidized-bed tank, with exhaust hood, appears behind drum of vinyl powder.) Duplicate oven for post-heating (fusing) is installed on the opposite side of the tank. Vertically sliding doors on both ovens are foot controlled.

The rack of six guards, preheated to the proper temperature, is immersed in the bed of vinyl powder until the desired coating thickness is attained. Immersion cycles normally range between 3 and 20 seconds, depending on such things as material, residual heat, complexity of the part and thickness of coating.

The fluidized bed process attaches a uniform thickness of plastic over the entire area. Because the coating never flows, the protection at the top is as heavy as at the bottom of the part. A single dip applies a 10-mil-thick coating of smooth vinyl. If a heavier coating is desirable, variation of the preheat and dipping cycle can produce a coating up to 25 mils thick. Postheating fuses the individual powder particles adhering to the part into a continuous, pinhole-free coating. After postheat, overhead conveyor carries cooling coated clothes guards to inspection, de-jigging and packing.

In assembly, the L-shaped end tab is hooked through the other end tab and bent flat. The vinyl doesn't chip or peel away from the sharp edges.

The importance of "dry-powder" is accented in producing a coating of uniform thickness over the entire surface and completely surrounding the wire. Because heat is emitted radially from the wire, particles build up a uniform thickness all the way around the wire. The postheat cycle merely fuses the individual particles into a continuous coating.

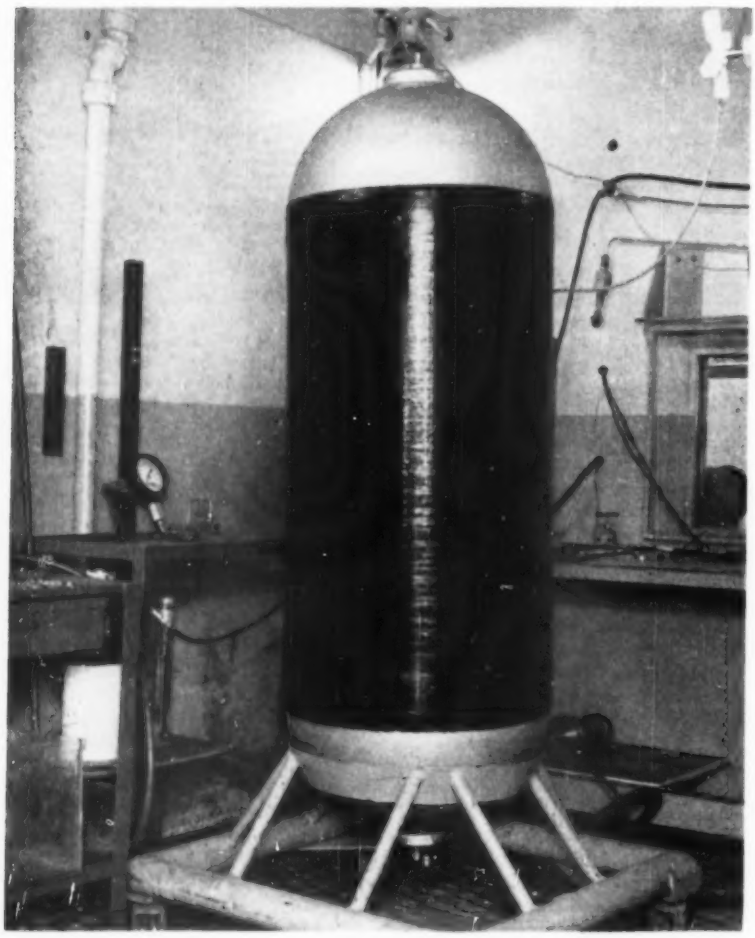
In solution dip processes, the finish flows, by gravity, across the surface. This forms an eccentric coating with the thin portion at the top. To gain sufficient protection at the top, more material is usually applied. With the fluidized-bed technique, less material is used for the desired protection.

Glass wrap reinforces pressure vessels

Additional resistance to internal pressure can now be achieved by wrapping the container with epoxy-impregnated glass fibers applied as roving (rolls or slivers slightly drawn out and twisted). As applied on special machines at Rocketdyne Div of North American Aviation, the method is saving 25% on the weight of combustion chambers for the Atlas booster engine. This technique is a development from the wire wrapping of gun and rocket tubes to increase burst resistance.

Fabrication of many pressure vessels with a glass-wrap reinforcement is expected by Rocketdyne's engineers to eliminate intricate welding and inspection tasks. Epoxy-impregnated glass roving is wound onto the pressure vessel under moderate tension, to closely pack, but not prestress, the fibers. Recommended procedure is to plan wrapping as a final operation, and to avoid attempts to "clean up" the finish. Any machining operations would reduce integrity of the completed structure.

Glass roving of extra-quality and uniform filament thickness has been found necessary in missile work. Material used is 20-end (one end has 200 filaments, 0.0004 in. dia). A moisture-resistant finish, or size, is required on the roving to maintain its strength when exposed to humid conditions. The size specified by Rocketdyne reduces the strength loss to 10%, as compared to 70% for glass fibers coated with conventional sizes.



25-in. dia tank . . .
with hemispherical ends is reinforced by winding glass-fiber roving over the critical areas. Roving can be wound circumferentially or in special patterns

Special Machinery Devised

In applying the roving, certain precautions must be observed:

(1) precision laying in selected cylindrical or helical patterns,

(2) gentle handling to avoid abrasion while wiping excess resin and applying tension. The new winding machine at Rocketdyne's plant is capable of handling a wide variety of shapes, lengths and sizes of pressure vessels, and meeting the requirements stated. Feed and speed ratios are automatically controlled. The need for inspection, other than a visual check, has been eliminated.

After wrapping, the part is rotated during an oven cure to prevent resin migration.

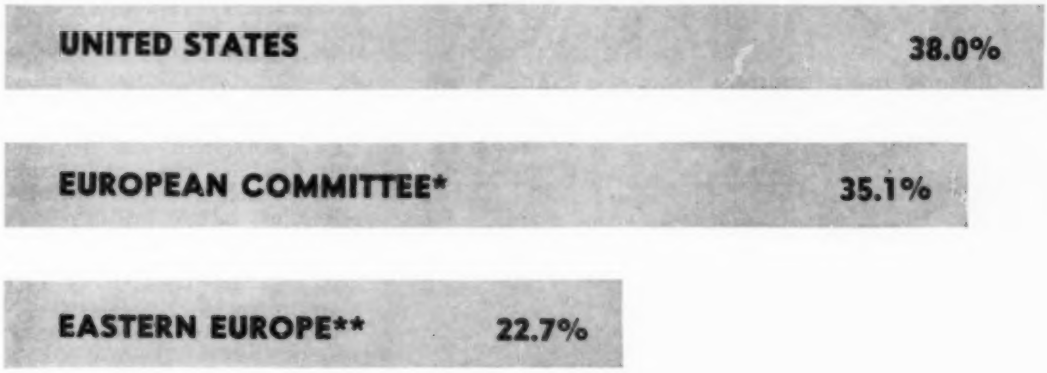
Details of Rocket Setup

As originally designed, the combustion chamber of the Atlas booster engine was reinforced by steel hoops brazed to square tubes that make up the chamber wall. Then, a second set of hoops was welded over the first set. Painstaking inspection was needed to assure integrity of the welds. And of course, the double set of hoops added much weight.

In the glass-wrap process, the chamber assembly is lightly sandblasted. The clean surface provides a good bond for epoxy resin sprayed onto the tubes to fill the spaces between them. Now, the engine is mounted on a mandrel that supports the area to be glass wrapped, and the whole is placed in the winding machine. Six strips of 20-end glass are epoxy dipped and applied to the assembly. Uniform application of the roving is assured by cam control of the tension arm and winding speed.

In the earlier phases of the work, the glass-wrap was applied to the whole combustion area of the engine including the nozzle. It was found that the significant advantages are in the higher pressure area.

Chambers have been run for as long as 4,000 sec. total time, with individual continuous runs up to 200 sec. To date there has been no evidence of failure in any of the reinforcement.



Percentages are based on value in Swiss francs in 1957

* Includes Germany, Great Britain, France, Switzerland, Italy, the Netherlands, Sweden, Belgium and Austria

**Includes Russia, East Germany, Czechoslovakia, Poland and Hungary

The changing pattern of WORLD MACHINE TOOL MARKETS

The U S machine tool industry built 38% of the world's production of machine tools in 1957, West Germany 14.5%, Russia 14%, Great Britain 8.9% and France 5.1%, according to a survey for the years 1955-1957 inclusive made by the European Committee for the Cooperation of the Machine Tool Industries. These figures are based on conversion of monetary value of machine tool output in each country into millions of Swiss francs.

Production figures used for the United States, the European Committee states, are higher than those issued here. They include parts manufactured as well as complete machines. The proportion of parts to complete machines in this country, the Committee says, is higher than in other countries because of U S shipments to foreign licensees and to foreign-owned plants.

(Editor's note: Figures for 1958 and 1959, contrasted with 1955 to 1957, would not be so favorable for the United States and would be more favorable for European countries, what with the sharp slump in machine tool shipments by U S builders and a much higher sustained rate of machine tool building in western Europe—and Russia.)

Countries comprising the European Committee—West Germany, Britain, France, Switzerland, Italy, Belgium, Netherlands, Sweden, Austria—produced 35% of the world output in 1957, the survey shows. Around 80% of the machine tool production of the European Committee countries is used within the producing country itself or is exported to other countries within the boundaries of the European Committee.

U S builders turned out 130,000 to 140,000 units during 1957, or about the same number of units as Russia, the survey reveals. But value of U S production was close to three times that of Russia's. Russia is credited with having built 121,000 machine tools in 1955, 133,800 in 1956, and 142,700 in 1957. In most machine-tool-building countries, in-

World production of machine tools (Cutting and forming types)

	Percent of world production in value			Value in million of Swiss francs		
	1955	1956	1957	1955	1956	1957
United States	40.0	43.0	38.0	4250	5580	5130
Germany	14.0	13.9	14.5	1483	1805	1952
Soviet Russia	13.6	12.7	14.0	1450	1650	1900
Great Britain	8.6	7.9	8.9	911	1017	1198
France	5.2	4.3	5.1	546	560	687
East Germany	2.8	3.1	3.7	300	400	500
Switzerland	3.3	2.8	3.0	350	373	400
Czechoslovakia	3.0	2.7	3.0	320	350	400
Italy	1.8	2.0	1.7	190	259	232
Japan	0.6	0.8	1.3	60	100	170
Poland	1.1	1.3	1.2	121	170	157
Sweden	1.2	1.1	1.0	118	138	133
China	0.8	0.8	0.8	90	100	110
Other countries	4.0	3.4	3.8	399	367	537
TOTAL ALL COUNTRIES	100.0	100.0	100.0	10,588	12,969	13,506

*Parts and accessories and second-hand machine tools as a rule are included in the figures

SOURCE: Statistics of European Committee, official production statistics, customs imports and exports statistics, general or particular data published in the press, especially in technical publications

World use of machine tools — 1957 (Domestic shipments plus imports)

	Value in Swiss francs	Percent of world total
United States	4,461	33.5%
Soviet Russia	2,025	15.2
Germany	1,148	8.5
Great Britain	1,122	8.4
France	986	7.4
Eastern Europe (except Russia)	791	6.0
Japan	370	2.8
Latin America	351	2.6
Canada	302	2.3
Italy	289	2.2
Switzerland	265	2.0
Other countries	2,011	9.1
TOTAL	13,330	100.0%

Where countries of the European Committee sold their machines at export (in millions of Swiss francs)

Exports to	1955	%	1956	%	1957	%
Other European Committee countries	692	53	846	53	936	48
Other European countries	146	11	152	10	180	10
RUSSIA and other Eastern European countries	26	2	47	3	80	4
Africa	60	5	70	4	88	5
United States and Canada	96	7	136	9	178	9
Latin America	102	8	106	7	118	6
Asia	114	9	160	10	273	14
Oceania	67	5	71	4	83	4
Other countries	2	—	4	—	2	—
TOTAL EXPORTS	1,305	100	1,592	100	1,938	100

What happened to average price per kilogram of machine tools exported by some countries of the European Committee

Exports to	1955	1956	1957
Countries of the European Committee	7.05	8.05	8.35
Russia and other Eastern European countries	8.65	11.75	10.20
United States	6.80	7.95	8.20
Brazil	8.55	8.05	7.60
India	5.80	6.50	7.40
Japan	10.40	11.25	10.90
TOTAL EXPORTS	7.25	7.80	8.30

formation was not available on numbers of units.

West Germany's machine tool production, by weight, amounted to 264,000 tons in 1957. In the same year France's output totaled 52,100 tons, Italy's 26,000 tons, and Belgium's 8900 tons. No comparable figures were available for Britain or Switzerland, but in 1955 British production added up to 146,000 tons. In 1957 East Germany's machine tool assemblies are estimated to have been 110,000 tons, Czechoslovakia's 100,000 tons, and Poland's 32,300 tons. Russia's machine tool production for 1956 is believed to have been 275,000 tons, but there is no figure at hand for 1957.

Exports totaled 47% of West Germany's machine tool output in 1957, the survey states. The ratio of exports to total production was 73% in Switzerland, 45% in Italy, 76% in the Netherlands, 63% in Sweden. On the other hand, the British export ratio was only 29% and France's 14%. Most of France's machine tool output has traditionally gone to domestic users. Within the Communist countries, East Germany exported 25% of its total, Czechoslovakia 66%, Hungary 49%, Russia 1%. The United States' export ratio was put at 16%.

Exports of machine tools from European Committee countries to Latin America were 118 million Swiss francs during 1957, compared with 105 million by the United States. U S shipments to Latin America, however, had grown more in the period 1955-1957 than those from Europe. European Committee countries got the lion's share of machine tool business in Africa, shipments there totaling 88 million francs in 1957, compared with U S's 5 million. The Asian market almost doubled from 1955 to 1957, the European Committee countries shipping in 273 million francs of machines in 1957, and the U S 117 million francs. Japan and India represented the biggest gains. The most conspicuous increase, the survey points out, was that of the United States to Japan: from 19 million francs' worth in 1955 to 89 million in 1957.

Consumption of machine tools (machines produced and installed in a country plus imports) in the three main groups—North America, the European Committee, the Eastern countries — showed the biggest gain from 1955 to 1957 in the eastern group (which includes Russia). The increase was 37%, compared with 24% in the European Commit-

tee countries, and 19% in the United States. In Asia, with the total volume low compared with the three large consuming areas, the gain ran to 125%. The increase in Latin America was 44%.

The value of machine tools per person, which gives some idea of the industrial level of a country or group of countries, was 25.6 Swiss francs in North America (mostly the U.S.), 17.7 in European Committee countries, 9.3 in eastern Europe, 1.8 in Latin America, 1.9 in Europe outside the European Committee countries, 0.5 in Asia, and 0.3 in Africa. The world figure is put at 4.7 for every inhabitant.

The European Committee admits that the percentages arrived at for world production "give an altered view of the reality" because only monetary value is used as the common denominator, no other basis for comparison being available. Only a comparison of output giving value, weight and numbers of machines might be a completely valid one. Nevertheless the European Committee survey reveals more about world machine tool production than any other study made up to now.

Machine tool exports
(Value in millions Swiss francs)

	1955	1956	1957
European Committee countries	1358	1633	1938
Eastern Europe	387	454	496
United States	585	661	839
Other nations	35	40	59
TOTAL	2365	2788	3332

Salt and water reclaim tungsten carbide

Hard materials can now be pulverized without mechanical hammering —solely by using the natural expansion of water of crystallization to split material into fine powder. Even scrap sintered tungsten carbide can be recovered as pure tungsten carbide powder with a new method developed in Japan.

According to Masamitsu Yoshimura, a research consultant, production of metal powders and such other finely divided materials as ceramic frit, paint pigment, pulverized coal and cement depends to a large extent upon a hammering action obtained in a ball mill.

Yet so much of the energy expended is wasted by mechanical friction, or converted into heat by the impact, that it is estimated only about 1% of the total energy input is actually used in pulverizing. Furthermore, the expensive balls wear out quite rapidly, and the material worn off these serves to contaminate the material being processed. This is perhaps the most serious problem in producing pure metal powders.

The method developed by Dr Rintaro Takahari of the Chibo Institute of Technology (US Patent 2,848,313), takes advantage of the natural expansion of water to provide the pulverizing action. The process may be compared to the splitting action that occurs when water seeps into cracks in rocks, freezes, and wedges the rocks apart. In the Takahari process, the water of crystallization is used as the wedge.

Some salts, such as sodium chloride (common salt) do not carry the water of crystallization, but the hydrates, such as calcium chloride, do carry it. When a dehydrated salt of the latter type takes on the water of crystallization, the volume expands, just as water expands when turning to ice. The degree of expansion is proportional to the amount of water carried by the hydrate. If the material that is to be pulverized contains a substance that forms a hydrate of a chlorine compound, or a sulphate, then the material may be caused to react with chlorine gas or sulfur dioxide. Innumerable seeds of wedges will then be formed on the surface and, if the material is left in the open air, the hydrate will continue to develop, and the wedges will be driven deeper and deeper until the material disintegrates completely. The action will be greatly accelerated if the material is immersed in water.

If the material does not form a hydrate, natural surface cracks would serve the purpose. But if there are no such cracks a fused dehydrated hydrate, such as calcium chloride, can be caused to seep into it by heating the material and cooling suddenly, or by employing ultrasonic energy.

Cemented carbide is essentially a mixture of tungsten carbide and cobalt, finely powdered, molded under pressure, and sintered at about 3000 F. It is widely used in metalworking, particularly as "throw-away" toolbits, but the scrap is discarded as unrecoverable. With the chemopulverizing method, the scrap may be reduced to powder and recovered, no matter how hard it is.

The scrap is heated to 1700 F, and chlorine gas is passed over it for 30 min. The cobalt then reacts and turns into blue cobaltic chloride. It is then put into water, where the chloride absorbs the water of crystallization and changes into reddish cobaltic chloride. The volume expands to four times during the process, and the carbide splits up with a popping sound, pulverizing completely in a few hours. As cobaltic chloride is soluble in water, the powdered carbide may be separated by filtration, and recovered.

High-quality iron powder can also be made cheaply from cast iron. When CI is repeatedly heated and cooled, it expands. If this expanded iron is dipped in fused calcium chloride and dropped into water, the hydrate takes up the water of crystallization and pulverizes the iron into fine powder. During the expansion, the carbon changes into crystals of graphite and separates from the iron. Thus iron powder containing less than 0.1% of carbon can be obtained. This same method of letting fused calcium chloride seep into the material is also effective in pulverizing ores and cements. Chemopulverizing is not, however, applicable to all materials. It is most effective on hard, dense materials, but is not suitable for porous materials.

Adjustable floor plates reduce

Precision telescope . . . helps level floorplate sections and align individual sections with each other. Floorplates, made in 12-by-12 and 6-by12-ft sections, are fully adjustable, do not have to be grouted in position. Special wrench turns jackscrews (20 in each large floorplate section) to level and align the section

By R F Thuma, supt. maintenance & tools section, West Allis Works, Industries Group, Allis-Chalmers Mfg Co

When floorplates that support large workpieces are easy to level, productivity increases because setup time decreases. Departing from conventional design, engineers at the Allis-Chalmers plant in West Allis, Wis. have developed floorplates that greatly reduce setup time for machining and assembly operations.

The new floorplates, which do not have to be grouted in place, provide adequate support for such heavy work as frames for huge turbines, generators and motors, rock crushers, and other industrial machinery that the plant makes. They are adjustable units, designed for large traveling-column machines (like the 8-in. horizontal bar machine on the cover of this issue).

Made in 12-by-12 and 6-by-12-ft sections, the foot-thick plates have machined edges that key and bolt together to form large workholding areas. Special hold-down bolts and supporting jack screws enable the plant to get practically any degree of alignment and levelness.

Old method cumbersome

To appreciate the advantages of the new floorplates, the old ones have to be described. For many years we made and installed large floorplates in the usual way. Cast in relatively large sections, they were machined, aligned, and leveled to the best of our ability. Next we grouted them onto heavy, reinforced-concrete foundations.

In time all large floorplates, no matter how carefully they are made and installed, get out of alignment because of the heavy loads they must support. To relevel grouted floorplates, we had to remove the plate sections and the supporting grouting, then repeat the entire installation procedure.

Because these installations take machines or assembly areas out of production for a considerable time, floorplate releveling operations almost always are delayed as long as possible. The result is that setup men and machine operators have to spend extra time to compensate for floorplate errors when they position and clamp workpieces.

Tight tolerances

With the new floorplates (developed at the West Allis works some time ago) we can get practically any accuracy of alignment and leveling. It is not difficult to level a 12-by-12-ft section and align it with adjoining plates to within 0.005 in.; with care, tolerances can be even tighter.

Recently, a floorplate assembly (twelve 12-by-12-ft and one 6-by-12-ft sections mounted on a reinforced-concrete base with a minimum thickness of 4 ft) was leveled optically to a total deviation of only 0.002 in. Spot checks made at intervals since the installation show that the floorplate assembly is still within this tolerance.

Floorplate construction

Each 12-by-12-ft section has 20 foundation hold-down bolts and 20 supporting jackscrews. (The smaller 6-by-12-ft sections have half as many bolts and screws.) Load-carrying capacity of these plates well exceeds our requirements: We would not hesitate to load a single 12-by-12-ft plate with 500 tons if necessary.

Hollow leveling jackscrews are an important feature of these floorplates. With this design, foundation hold-down bolts can be installed

setup time

concentric with the plate supporting screws.

Each hold-down bolt is made in two sections. The lower section is welded to a ¾-in.-thick steel plate on the bottom of a steel tube. When the concrete foundation for the floorplate is poured, this assembly is anchored in it.

At the top of the concrete foundation another steel plate, drilled to clear the upper section of the hold-down bolt, is leveled with three small screws and aligned with the hold-down bolt within 1/64 in. before a 2-in.-thick grout facing is poured over the concrete foundation. A small cardboard tube, placed in the steel hold-down-bolt tube, keeps grout out of the steel tube.

To assemble a floorplate, we thread upper sections of the hold-down bolts into double-length nuts on the lower hold-down section, then position pairs of spherical washers above the jackplates. Next we place leveling jackscrews over the hold-down bolts and thread them into tapped holes in the floorplate sections. These jackscrews bear against the pairs of spherical washers and hold the floorplate sections 2 to 3 in. above the grouted face of the foundation (see sketch).

To level the plate sections, we use large wrenches (made from sections of steel tubing) that permit easy adjustment of the leveling jackscrews and their locknuts. With the aid of a leveling telescope, we can then level each plate section.

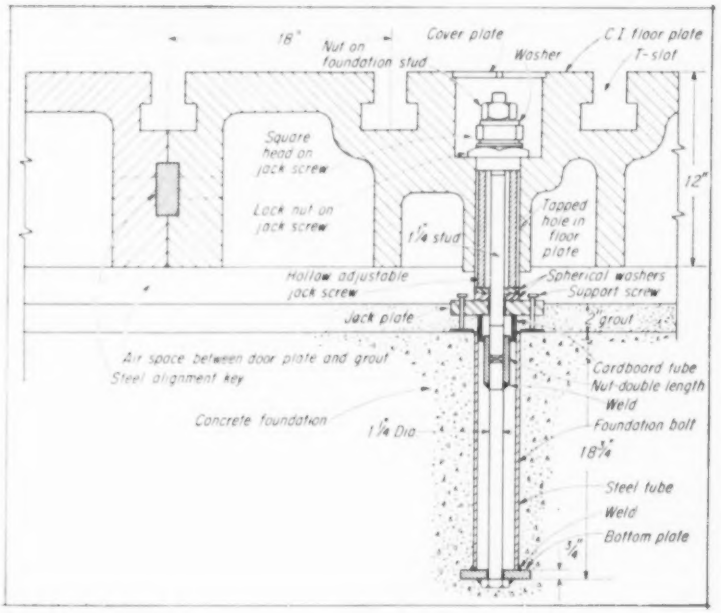
Machine efficiency improved

Extended machine traversing ways and large floorplates, as employed with two horizontal bar machines installed in the plant, soon pay for their added cost.

Setup men can easily line up and clamp another workpiece in place on one end of a large plate while the machine is working at the other end. The only time lost from production is the time it takes to traverse the machine column from one end of its bedways to the other, plus time for tool changes.

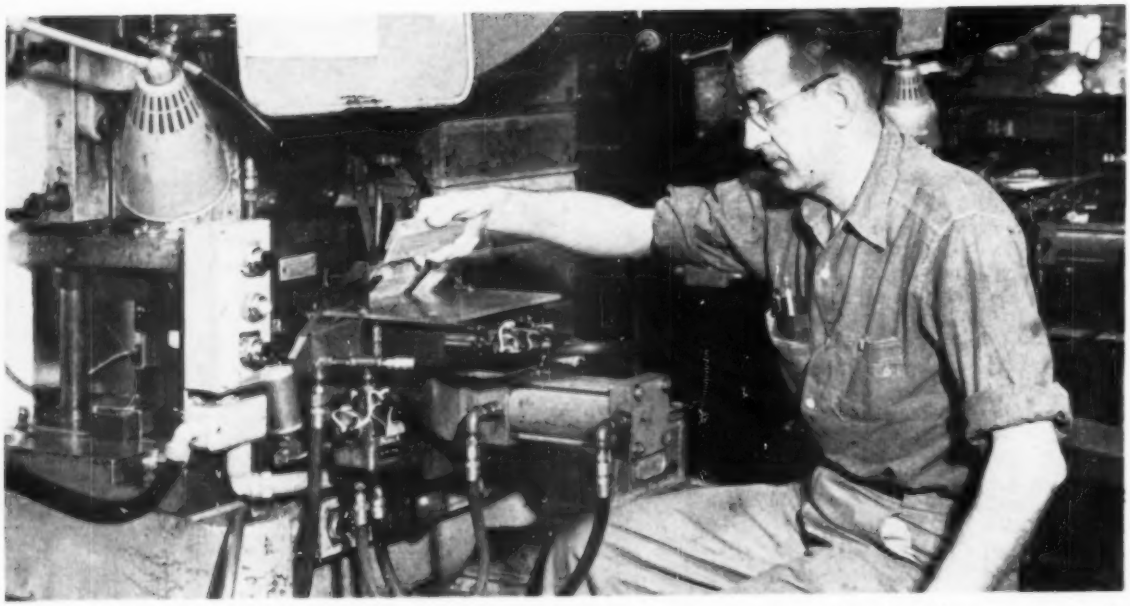
This increase in machine efficiency increases materially, of course, when column traversing ways and the floorplate in front of the machine are kept level and in accurate alignment. Otherwise, the machine has to be taken out of production for the time required to align the workpiece with the machine.

Setup and machining . . .
are possible at the same time with this setup. Here two large workpieces are set up on accurately leveled floorplates in front of large 7-in. horizontal mill with long floor-level traversing ways. Floorplate is made up of eight 12-by12-ft sections

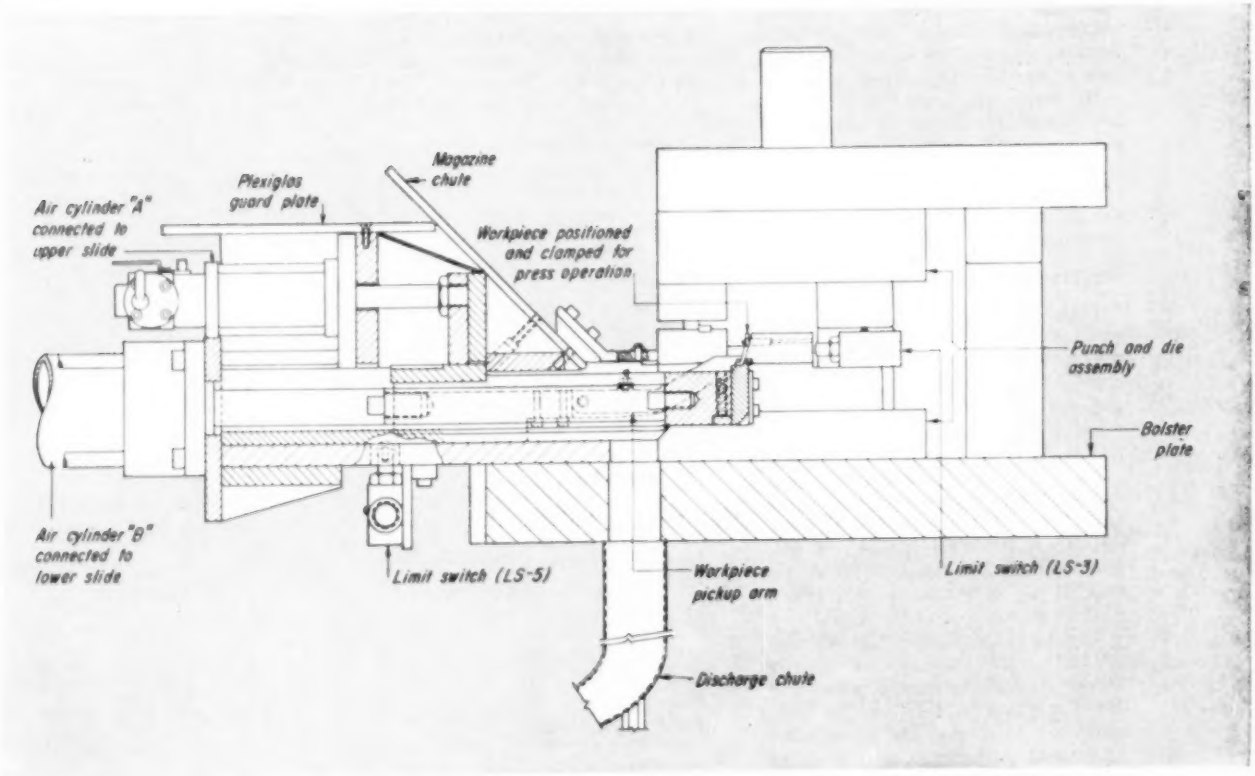


Sectional view . . .
of 12-by-12-ft floorplate shows typical foundation hold-down bolt and leveling jackscrew installation, as well as the method used to key and bolt adjoining sections. T-slots in all plate sections are same size, to fit hold-down studs and slot nuts

Double-acting



Press feeder . . .
Double-acting air-powered feeder moves vertical armatures for crossbar switches into press dies that perforate, notch, and clip formed edges. This is final operation on the carbon-steel parts



Feed action . . .
Upper cylinder shuttles bottom part from magazine chute into position so spring-loaded pickup arm on lower cylinder can advance the part into the die. LS-3 closes to actuate press air clutch

feeder serves a fast press

By A C Gustafson, product engineer, Western Electric Co, Chicago

Interlocking controls and two air cylinders at Western Electric's Hawthorne plant feed partly formed workpieces to a single second-operation die that operates at 1000 parts per hr. This rate is maintained even though the feeder inserts the part, then withdraws it from the die, all from the front of the press.

The part is a 0.0938-in. steel plate that becomes a vertical armature for a crossbar switch in a dial-telephone control office. It must be perforated, notched, and edge-clipped in the press, which is a No. 5 Minster OBI with 2-in. stroke. The feeder was developed by tool and manufacturing planning engineers in the plant to allow a high rate of production with minimum operator fatigue and maximum safety.

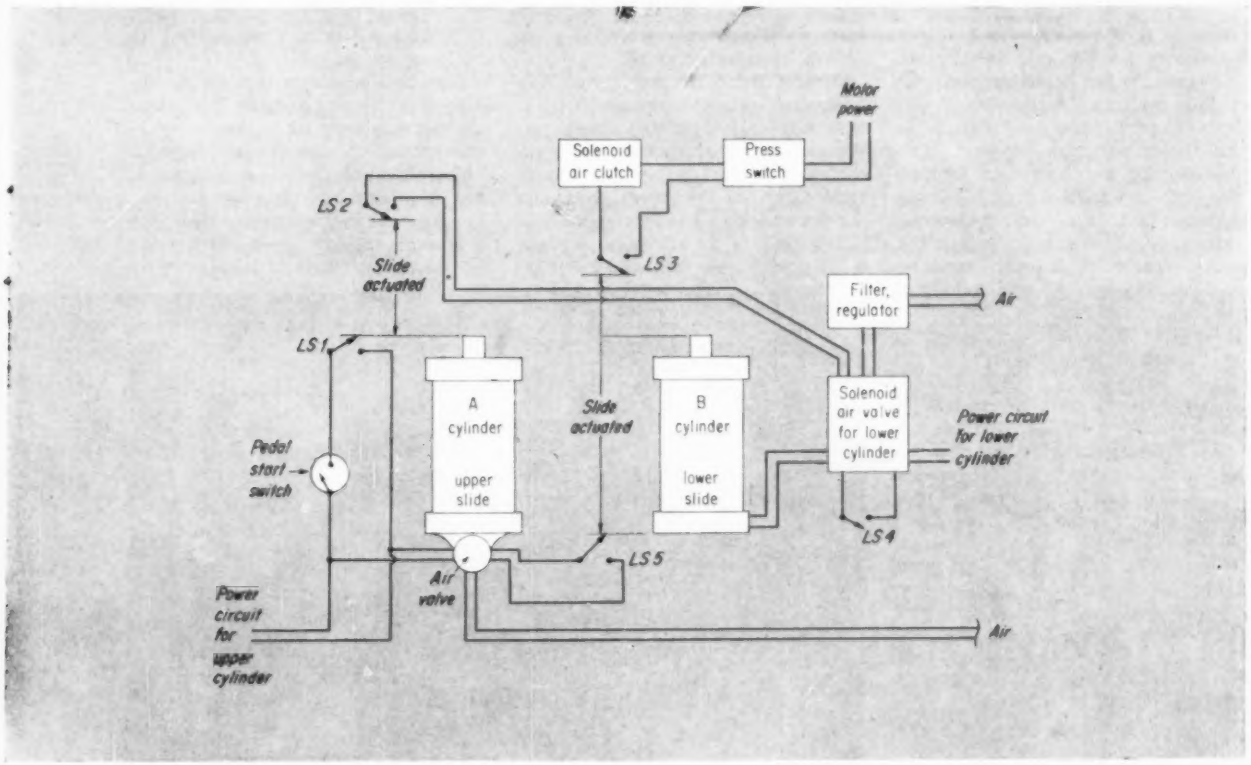
Parts are fed progressively into the die by two slides, both powered by air cylinders, with the second slide holding the part in the die during the press stroke. Control is by limit switches and air valves, all interconnected so the operator merely has to depress a pedal in front of the press and keep the magazine chute filled with the low-carbon steel parts.

Feeder action follows this cycle: LS-1 and LS-5 are normally closed when the press is idle (see sketch of circuit). When the operator steps on the pedal control, the solenoid four-way valve operates the upper cylinder to power the upper slide forward. The slide picks up a part and carries it toward the die. At the end of its stroke, the upper slide trips LS-2, which energizes the lower cylinder. A spring-loaded pickup on the lower slide grips the part and carries it into the die. There the part is pushed against a sliding block, which trips LS-3 as the part seats in the die. The switch trips the press air clutch, which starts a press stroke.

As the ram returns after its stroke, a cam on the press closes LS-4, which returns the lower slide by reversing the lower air cylinder. This takes the work from the die. As the lower slide retracts fully, it closes LS-5, which reverses the upper slide to rest position. At the same time the work is dropped into a discharge chute and another part is dropped from the bottom of the magazine chute to be picked up by the upper slide when it starts a new stroke. The upper slide also closes LS-1 as it returns to rest, so the mechanism is set up for a new cycle if the operator has the pedal depressed.

If the operator keeps his foot on the pedal, the interlocking controls maintain continuous action, and the press keeps cycling. Parts are held in the die on edge.

Both air cylinders are controlled by solenoid valves, which makes all control electrical and which allows interlocking the whole system. The press will not cycle unless a workpiece is in position.



Control circuit . . .
Five limit switches are tripped by the feeder slides and the press ram to control action through three solenoid air valves. Press speed is 125 rpm

Mexican businessmen discuss merits of a new lathe at the Soviet Exhibition

The sales pitch: cheap machine tools on easy payments . . .

Reds drive for Mexican markets

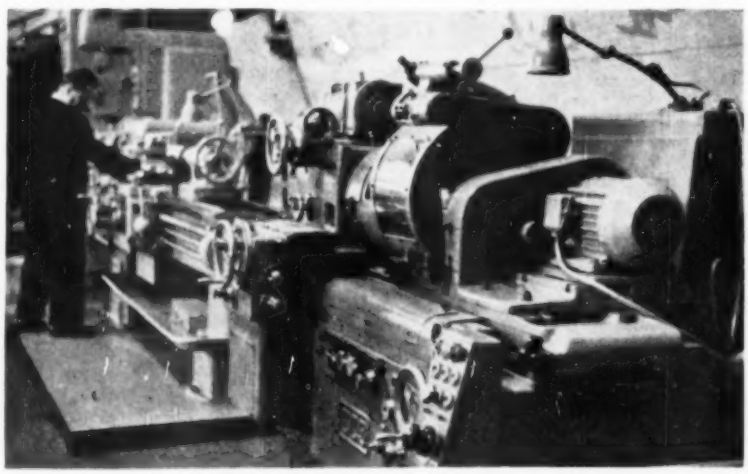
Russia is trying hard to get a foot in the door of Mexico's metalworking plants. So far, its attempts to sell machine tools on a large scale South of the Border have met with little success, despite the fanfare of a huge Soviet Exhibition in Mexico City, and the inducement of cheap machine tools on easy payments. Oddly enough, the greatest stumbling block to sale of Russian machine tools in Mexico is the solid entrenchment of satellite Czechoslovakia in the metalworking equipment market. The Czechs were in Mexico first with the same sales pitch — low prices and extremely easy time payments—and their machines have gained widespread acceptance and respect in Mexico.

But with the advent of the Soviet Exhibition in Mexico City's National Auditorium, the Russians are pulling out all stops in an effort to become Mexico's No. 1 supplier of machine tools and related industrial equipment. Virtually every machine in the Exhibition is so new that it wasn't even shown in the recent Exhibition in New York.

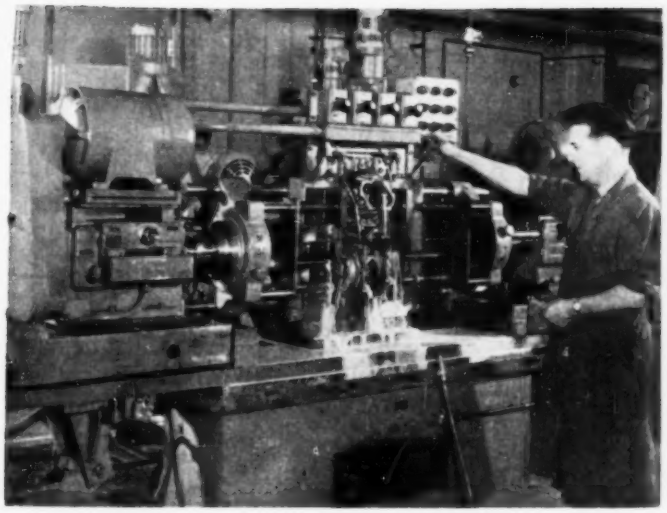
Orders are being taken for machine tools on display at the Exhibition by a Mexican agency. Selling prices are reportedly one-half that of U S equivalent machines, and the agency will accept payment in pesos over a long-term period.

Despite these obvious lures, Russian machine tool sales aren't up to expectations. Although they are adequate to Mexican needs, the machines represent no startling innovations, nor is the finish good. One big drawback in Russia's sales drive is the lack of an adequate replacement parts stock in Mexico, but the Russians are reportedly aware of this and are making arrangements to build up stocks.

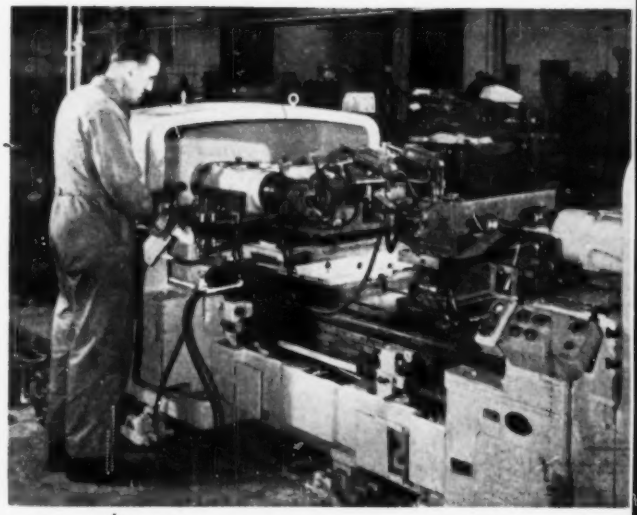
But U S machine tool representatives in Mexico suspect that Russia has an ace up its sleeve—a large-scale swap of Russian machines for Mexico's agricultural surpluses. If the Russians can put just one big government-to-government deal like that over, they will more than make up for current lack of success in individual sales.



Russian grinder (foreground) and lathe are brand-new prototypes



Three-way machine . . .
Crankcases for 35-hp engines are drilled, reamed, and spotfaced two at a time in air-powered fixtures



Double-end boring . . .
Cylinder bores in 35-hp blocks are roughed and finished within 0.001 in. for alignment

"Get-modern" drive aims for a British share of the outboard market

Streamlined product design, up-to-date mechanization, and a 20% cut in prices by F Perkins, Ltd, are the first steps in a drive to break into the American-dominated outboard-engine market. The British company, with great experience in diesel engines, is installing "150 tons of US machine tools" along with domestic equipment to set up a completely modern flowline. The products, as modern looking as any, will be made in 6-, 16-, and 35-hp sizes.

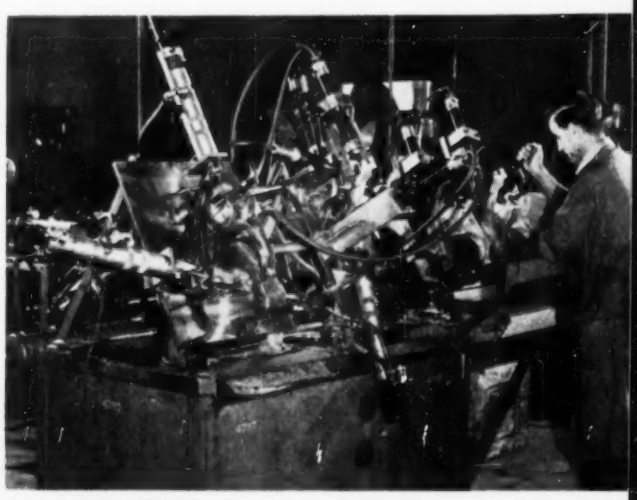
Production is expected to be 150 engines per 8-hr shift with only 150 workers, aided by multiple-spindle machine operations, conveyorized spray painting, and a variety of air-operated tools.

One outstanding operation is at a two-way, four-head machine that rough and finish bores cylinder-block liners, and also produces the parent bore in 16-hp blocks before the liners are inserted. All drilling and tapping on the 35-hp blocks are done on two machines with 60-second cycles.

Some 90% of the castings for the 6- and 35-hp engines are produced by the latest technique in pressure die casting. The large block is cast with four hydraulically operated cores, and diecasting tolerances overall are to 0.012 in. CI cylinder liners are centrifugally cast in position.

The engines were designed in the US, but Perkins holds world manufacturing rights, and will sell the engines domestically and in the US.

Bracket drilling . . .
Kingsbury special machine drills and bores swivel brackets for the 16-hp engine. Five heads are engaged



Carrying handles . . .
Built-up fixture with 11 air-powered drill units does drilling, reaming, and tapping four ways on 35-hp handles

Works and factory managers . . .
from Thompson Ramo Wooldridge plants all over the country gather in Detroit to start two-day conference on manufacturing problems

Keeping the spotlight on manufacturing

Top manufacturing men, from more than a score of separate operations, meet to discuss manufacturing problems. This free exchange of ideas and techniques focuses attention on the company's manufacturing abilities

In a multi-plant company that makes an endless variety of components—automotive, aircraft, missile, electronic, industrial—what problems are common to each plant? Does a California plant that makes tiny micro-diodes, no larger than a small needle, have any ideas which might help an Ohio plant that produces large pressure vessels?

Thompson Ramo Wooldridge, Inc, thinks so. The common areas can be summed up in one word: Manufacturing. More concretely, every manufacturing manager—no matter what his plant makes—has four universal problems: manpower control, supervision, communications, and production control.

Recently some thirty members of the TRW complex, all of them top manufacturing men, met in Detroit to discuss these problems. Result of this second annual manufacturing conference: Each manufacturing manager goes back to his plant with new ideas, company-inspired.

Decentralized operation

Why all this togetherness in a company noted for its diversification? The conference, TRW feels, does more than enable participants to swap trade secrets. It keeps interest centered on what the company considers its main asset—its manufacturing abilities. And it is an effective way to bring together spokesmen for two recently consolidated (1958) efforts: Thompson Products and Ramo-Wooldridge. Finally, the conference shows each manufacturing manager where to go for help on problems.

This last point is important at TRW, a classic example of decentralization. In each of the company's plants (some of which contain several separate operations) the local manufacturing manager is expected to determine and solve problems important to him, and he is staffed to do so. If necessary, a small group of corporate-staff industrial engineers is available to assist him. The corporate staff, at company headquarters in Cleveland and Los Angeles, is not intended to supply experts who can attack every problem. Because the TRW product range is so varied, the company does not consider it feasible to provide a staff specialist for every product and production method.

As Carl Goldbeck, Asst Director of Industrial Engineering on the staff, puts it: "We act chiefly as a catalyst, and concentrate on advanced planning and major corporate problems relative to manufacturing."

The two-day annual conference, then, has several concrete goals, all designed to bring the company's manufacturing skills into better focus.

Planning the meeting

This second annual meeting (the 1958 conference was held in Cleveland) brought to Detroit manufacturing men who represent some two dozen plants from Pennsylvania to the West Coast. Arranged by Ken White, Staff Director of Industrial Engineering, the two-day session was an integrated series of talks, group discussions, and visits to plants in the Detroit area.

Planning for the meeting began well in advance. The list of proposed subjects for discussion, sent to participants for their suggestions, gives a good idea of what such a meeting

might encompass: factory expense, forecast, and control; manufacturing research; tooling; simulation of problems on computers; facilities planning and organization; new-product production; manufacturing organization; labor relations; scrap; discipline; training.

From this proposed list the staff, acting on suggestions from the men who would attend the meeting, selected three that seemed to have the widest appeal:

- Manufacturing expense control
- Manufacturing organization
- New-product production

By planning talks on these subjects, and by arranging sightseeing trips to TRW and other facilities in the Detroit area, the staff was able to fit into two days a schedule that might otherwise have taken a week.

Subjects discussed

Some fifteen talks were given during the two-day meeting. Most speakers were works or factory managers from company plants; in addition, a few outside experts were brought in to contribute ideas.

Because each participant was familiar with the topics, and because all problems were common, speakers were able to cover their subjects in depth, reducing to a minimum the generalities that often plague conferences. The best indication of this depth is a description of some of the subjects that the group was exposed to :

CONTROLLING EXPENSES:

An A-to-Z description of how the company's Michigan Division controls manufacturing costs in its four plants, with illustrations of quality-control, labor-performance, budgeting, and performance-reporting techniques in use.

Factory expense control and forecasting at the Electronics Works of the company's Tapco Group, with descriptions of management reports, operating review data, and forecasting reports.

The cost-control setup at Tapco's Harrisburg Works.

ORGANIZATION:

Detailed descriptions of manufacturing organization in TRW plants located in Ohio, California, and Missouri.

NEW PRODUCTS:

How the company's Tapco Group and Bell Sound Division put new products into production.

PLANT TOURS:

Visits to the company's Van Dyke operation just outside Detroit and a trip to the General Motors Technical Center.

Long-range benefits

At the end of the meeting, every participant had a much clearer picture of manufacturing setups throughout the entire company. Equally important, every member of the group knew where to go for advice and help on his own manufacturing problems. This awareness—so often missing in a company with interests so varied—should pay off in the future. The corporate staff hopes that meetings such as this will encourage manufacturing men to exchange ideas, borrow technical help from each other, and work out constructive solutions to mutual problems.

The basic goal of the meeting—to focus attention on the company's manufacturing skills — was best summed up by H A Shepard, vice president and general manager of Thompson Products Divisions, who addressed the meeting. Noting that the company makes a bewildering array of interest-provoking products, Shepard commented, "These exotic products may call for new words and a new vocabulary, but somebody actually has to make them."

As proof of TRW's continued faith in its manufacturing people, he pointed out that the company has spent more than $95 million on plant and equipment in the last five years, plans to spend another $70 million during the next three or four years.

To keep its manufacturing men abreast of this expansion, and to take advantage of their pooled experience, the company will continue its annual meetings. If it continues its plan to hold the meeting at a different plant each year, the group won't get back to Detroit for quite a few years.

Plant tour . . .
of company's Van Dyke operation was a highlight of the meeting. Here manufacturing men from plants in Ohio, Colorado, and Canada are briefed on plant production techniques

Talks on manufacturing . . .
were made by works managers and by outside experts. Here Hayward Gay, vice president of Cincinnati Milling Machine Co, tells of latest developments in machine tools

Individual offices . . .
for each surface grinder line the wall in the background. Each work quarter is air-conditioned, soundproofed, has a picture window that assures privacy yet permits visual contact with fellow workers. In the foreground, internal and external grinders do finishing operations on tool and die components

Craftsman at work . . .
in his own private office listens, in soundproofed isolation, for the "kiss" of grinding wheel to a section of a tungsten-carbide die

Jig grinding room . . .
in this Magnetic Metals Co plant houses three machines and their operators. Here the three grinders are working on electronic die components

Surface grinders get private offices

By Cortis F Sherman, chief engineer, Magnetic Metals Co. Camden, NJ

To create an atmosphere in which our employees can do their best work, we have recently built individual shop offices for operators of surface die grinders. These private work quarters are clean, quiet, air-conditioned rooms that are paying off in better morale and improved productivity.

At Magnetic Metals, where a tolerance of 0.00005 in. on a die is not unusual, it's vitally important to attract and hold the best die makers and grinders. Along with the steady growth of demand for magnetic-core parts for communications and electronic control equipment, and with the trend toward miniaturization, the company has worked toward providing the closest thing to ideal working conditions for the craftsmen who produce dies to these ultra-critical tolerances.

Built-in comfort

The new work quarters are designed not only to keep workers comfortable, but to help keep them with the company in the future. Before establishing the offices, we had developed the production techniques, and we had the skilled manpower. Our objective was to improve the working atmosphere, to keep the workers and to attract others as the demand for our products grows.

The new toolroom layout is the result of studies by our engineers, aided by the comments of the men themselves. When the first booth was designed, in 1956, we conducted a two-year testing schedule: Surface-grinder operators took turns working in the single "shop office," then each one was invited to make suggestions following his tour of duty in the unit.

Suggestions help

Because the idea was a new, sharp departure from the conventional open toolroom to which diemakers are accustomed, some of the men didn't react favorably at first. They were conditioned to the sound of lathes, grinders, and drills surrounding their machines, and they missed the contact with fellow workmen. Their strongest initial criticism was that the booth cut them off from normal contact with others; it made them feel lonesome, they said.

To relieve this sense of isolation, we installed large picture windows in each office. Once they were able to see the activity around them, but at the same time were protected by soundproofed walls and ceilings, they could enjoy privacy without losing contact with others.

During the testing period one veteran craftsman, who thought there was no great value in the new idea, took a lengthy vacation. After being away from his grinder for longer than a weekend, he realized on his return that the old toolroom was noisy. He welcomed the opportunity to work in his own private shop. Because he had been away from the job so long, he had learned that the separate offices eliminate interruptions and distractions that eat into valuable production time.

While the diemakers were reporting their opinions on the experimental shop office, plant engineers were investigating air conditioning, lighting, soundproofing, and dust control. Because of this spadework, we were able, after the test period, to start at once on the kind of office we wanted to build.

No lost setup time

Each craftsman has his own nameplate on the sliding door to his new office. And the door can be locked, so that he can leave work in position overnight. In this way, he loses no time setting up jobs and getting out tools at the beginning or end of the working day.

The booths are roomy, comfortable, and fully equipped. Each is furnished with a grinding machine, workbench, gaging equipment, special tools and fixtures, and shadow-free fluorescent lighting.

The company recognizes the importance of other equipment, too. Each man was allowed to choose the type of stool or chair he wanted. In addition, he can have a personal radio in his office; a diemaker in one room can work to the soothing strains of mood music, and the craftsman in the next room can be grinding away while following the latest chapter of a daytime serial.

Ideal working climate

Each office has individually controlled air conditioning, with an automatic air-mixing unit that filters and recirculates cooled air. The air-conditioning system (York) is practically draft free; air movement is no greater than 50 feet per minute. Variation in temperature is only plus or minus 1 degree, and relative humidity (with a similar low variation) averages 45%.

Capacity of the air—blown through a hot-and-cold, dual-duct distribution system—is 9670 cfm. Three banks of filters in each office keep the atmosphere dust-free: Before and after it is "scrubbed" by an electrostatic filter, the air passes through mechanical filters.

Shadow-free lighting, which the company had previously installed in a product-inspection area, was adopted for the grinder offices. With high-output fluorescent lights under a luminous ceiling, the entire ceiling becomes one wall-to-wall enclosed light, with an average reading of 175 foot-candles. These highly reflective tubes give a uniform light, so that grinder operators can read measuring devices and follow their very critical grinding easier than under any other artificial lighting arrangement.

Soundproofing aids workers

Besides eliminating distractions, the soundproofing built into each shop office serves another important purpose. The first company in the U S to build an all-tungsten-carbide die, Magnetic Metals uses tungsten carbide for 90% of its dies. But carbide, unlike tool steel, doesn't emit sparks when it's ground. Operators must listen carefully for the "kiss" of the wheel as it contacts the die. Sound-proofing has helped craftsmen considerably to hear this sound without undue effort.

Other offices

Besides the unique offices built for each of its surface-grinder operators, the company also has several other air-conditioned, sound-proofed rooms. The jig-grinding room, for instance, houses three machines and their operators. A large jig-boring unit, resting on a concrete block suspended on springs, is housed in a controlled-atmosphere room. And inspectors test each die component in a specially designed room that is held within 1 degree of a constant temperature at all times.

Adhesive bonding plus riveting

Adhesive bonding, rapidly becoming one of the aircraft industry's most versatile tools, teams up with automatic riveting to provide the Convair 880 and 600 jet transports with leakproof, integral wing fuel tanks. And at the same time, the bonding contributes added structural strength and fatigue resistance.

The bonding process, developed jointly by Convair Division of General Dynamics Corp and the Minnesota Mining and Manufacturing Co, is known as the Scotchweld process and has been used successfully for sealing the integral wing tanks of the Convair-built F-102A and F-106A jet interceptors. In more than four years of use by the Air Force the F-102A has never developed a leak in its wing tanks.

Over $700,000 have gone into the recently completed Scotchweld facility located at the San Diego plant of Convair. It houses an electric oven over 80 ft long, 20 ft high, and 10 ft wide; six 4 x 10 x 35-ft processing tanks; a paint booth; a three-compartment pre-curing oven; a 61-ft-long, multi-purpose tank and oven; and a craneway structure.

Adhesive-bonding film . . .
is applied to the faying surfaces of all structural members that form the leakproof wing tanks on the Convair 880 and 600 jet transports. Special rivets join wing parts and also provide necessary clamping pressure on adhesive film

Wing structure

The wings of the 880 and the 600 have been designed so that spars, bulkheads, and skins form the four integral wing tanks, two to the right and two to the left of the fuselage.

Each detail and structural part of the wing is first cleaned in a series of chemical baths and water rinses, then immersed in Alodine 600, a chemical bath that puts a conversion coating on the parts. This coating acts as a binder between the aluminum alloy and the Scotchweld primer. After they are oven dried, the parts are sprayed with Scotchweld primer and then returned to the oven for a 30-minute pre-cure at 175 F.

Because of their length, spar rails are treated in the 61-ft combination tank and oven. The tank is used successively for soap, acid, and rinse solutions, and then becomes a "water-heated" oven for drying and pre-curing.

The cleaning and priming process is carried out in a production area that is air conditioned and kept under slight air pressure, so that no dust can enter through the open doors. Before the parts leave the clean room, a protective tape is put on all faying surfaces to keep them clean during pre-assembly handling.

Now the wing-skin-and-stringer panels are assembled, placing strips of Scotchweld AF-10 structural adhesive film between mating surfaces. The panels are tack riveted, placed in holding fixtures, and are moved to the riveting machines.

Automatic riveters

Next step in the assembly operation is riveting, making use of four completely automatic riveting machines developed to Convair specifications by the Nuclear Products-Erco Division of ACF Industries, Inc, Riverdale, Md. Three of the machines handle wing panels; the fourth, fuselage panels.

A wing-panel riveter performs the following seven operations:

- Clamps a stringer to the aluminum-alloy skin panel at the 500-psi pressure necessary for successful Scotchweld bonding
- Drills and countersinks the rivet hole
- Inserts the rivet
- Heads the rivet with a squeezing, rather than a vibratory, action at pressures up to 15,000 psi
- Shaves the rivet head flush
- Unclamps, then air-blasts chips away from the work area, and,
- Moves skin and stringer panel to the next rivet location.

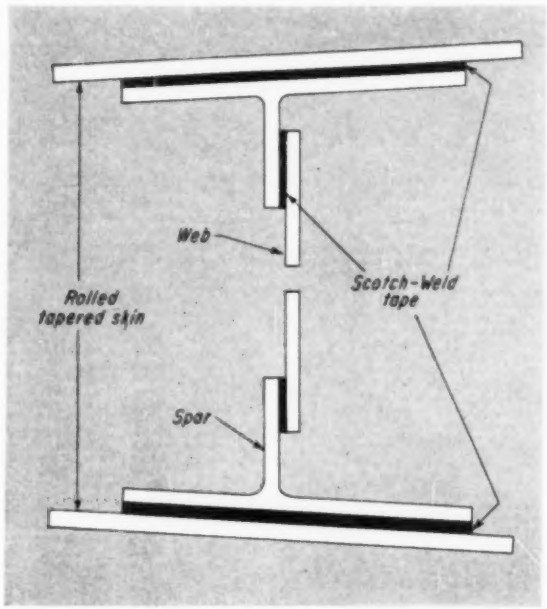
Each machine is designed to have a maximum capability of more than 20 rivets per minute, but this is reduced by spacing requirements and joint thickness, so that for a spacing of one inch on rivet centers and a thickness of $\frac{3}{8}$ inch, the machine sets 12 rivets per minute.

A templet at the side of the machine locates the rivet positions. As it travels down a tapered wing skin, the machine, through a sensing device in its lower head, determines the proper length rivet and selects it from one of three hoppers on the machine. For the wing-tank the panels, Convair uses a specially designed, modified Straylor rivet which provides a metal-to-metal, fuel-tight seal.

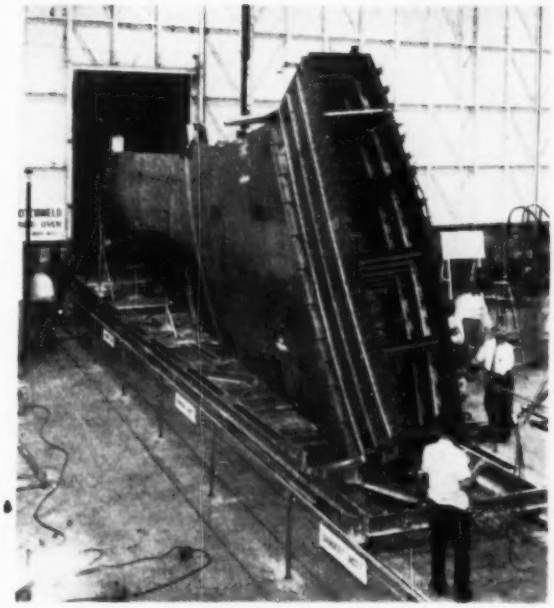
The Erco machines can handle skin-and-stringer panels up to 12 ft wide and 25 ft long, and the 120-in. throat accepts even extremely curved skins. Convair-San Diego's tooling department designed and built the worktables, individual holding fixtures, and the control console for these riveters.

The complete right and left half-wings are then assembled in huge wing bucks (90 ft long, 75,000 lb each), with strips of Scotchweld AF-10 film between the faying surfaces of the skin and the structural

builds leakproof tanks



Spar section of 880 wing-tank . . .
shows a typical Scotchweld application. Tape is applied to all parts forming the tanks. Primer is applied to all wing parts because it improves corrosion resistance



Half-wing enters furnace . . .
for one-hour, 320-F curing cycle. Heat melts tape to form tough, leakproof seal. Furnace, 80 ft long, is large enough to handle two half-wings at same time

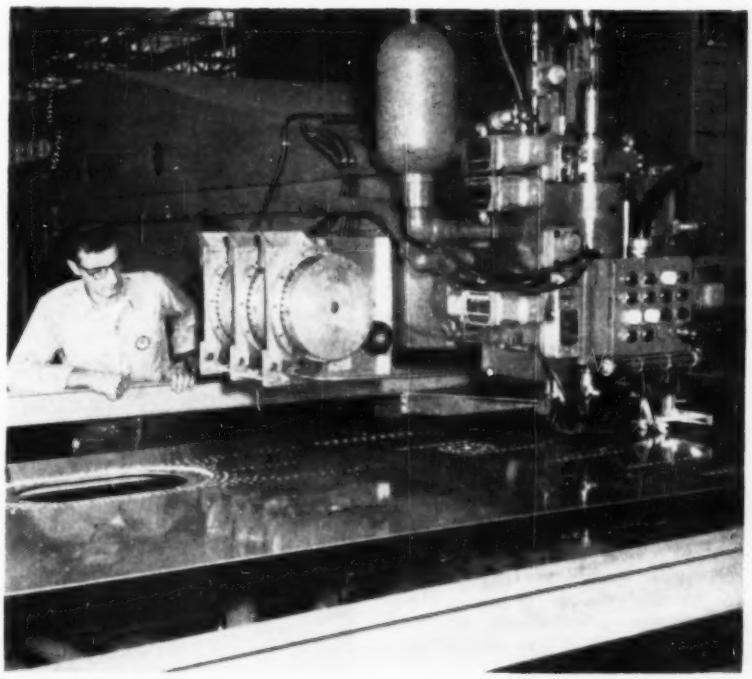
members that form the wing tanks. Once again, modified Straylor rivets are used to join the skins, ribs, and spars, at the same time supplying the necessary clamping pressure on the adhesive film.

Into the baking oven

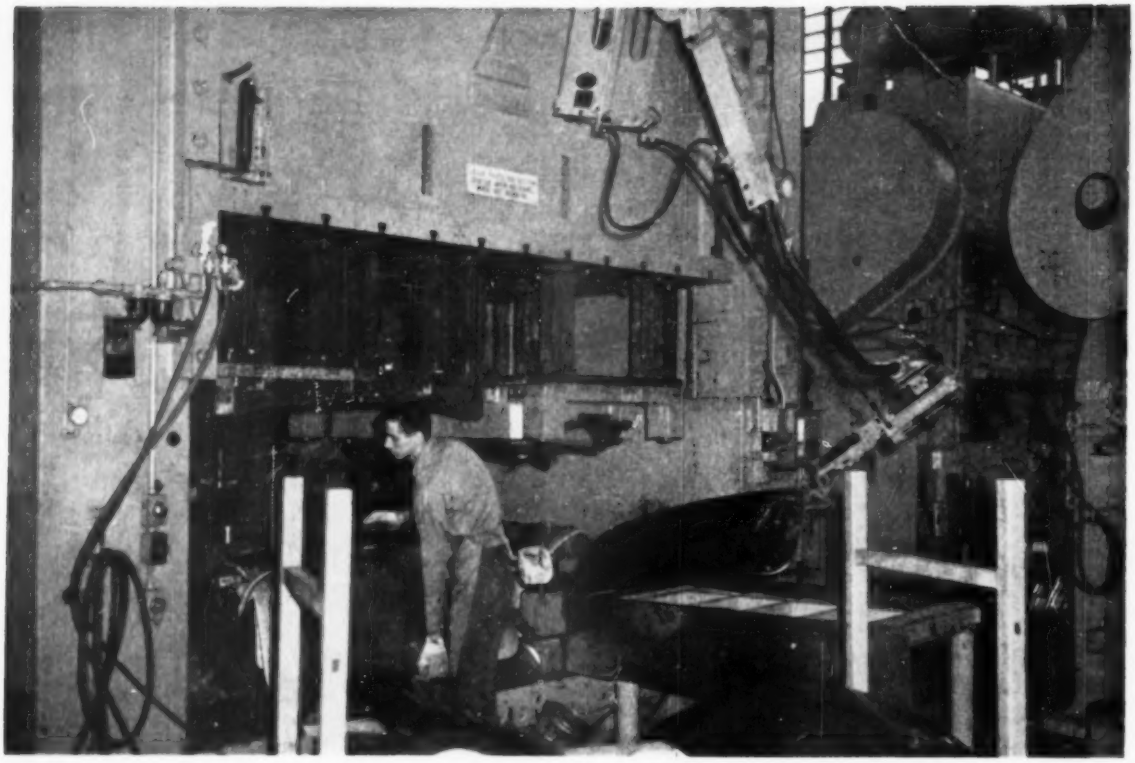
After final assembly, both half-wings are transported from the wing bucks to the 80-ft-long electric oven by a cart which travels on rails leading directly into the oven. The heat, 320 F for one hour, melts the adhesive film and it cures to a tough, fuel-resistant barrier.

While the primary purpose of the bonding process is to provide a leak-proof joint, it also provides

- Added strength comparable to that from 3/16-in. rivets spaced at three diameters
- Reduced joint slippage because the adhesive shares the load with the rivets. It allows some movement without breaking the seal, permitting the fastener to pick up the load
- Added fatigue resistance
- Added structural rigidity
- Improved corrcsion resistance. Because it improves corrosion resistance, Scotchweld primer is applied to all parts of the wing box structure, whether they form part of the fuel tanks or not.



Automatic riveter . . .
handles wing-skin-and-stringer panels up to 12 ft wide and 25 ft long. It clamps, drills, countersinks, inserts rivet, heads, shaves, unclamps, blows chips away, and moves panel to next rivet position. Machine automatically chooses proper length rivet from one of three hoppers on the machine



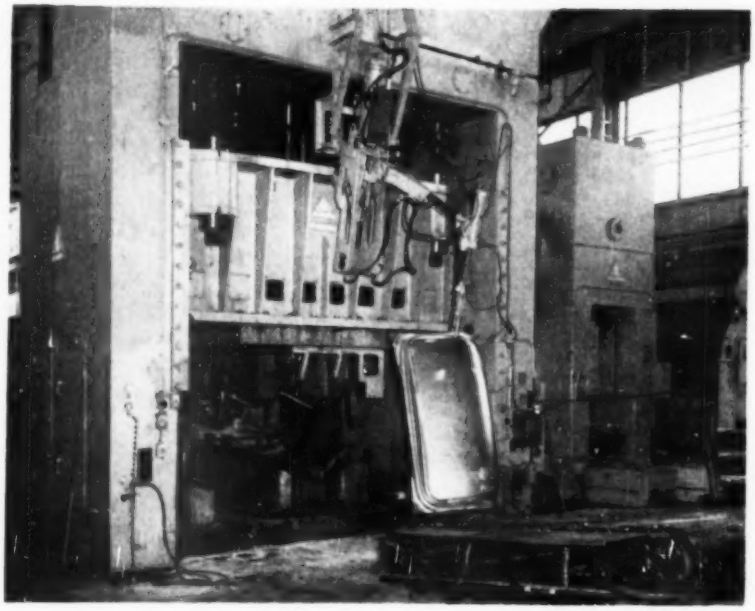
Off-center extractor . . . Trim press is served by extractor. Presses are loaded manually, unloaded mechanically

Press extractors work out for short runs

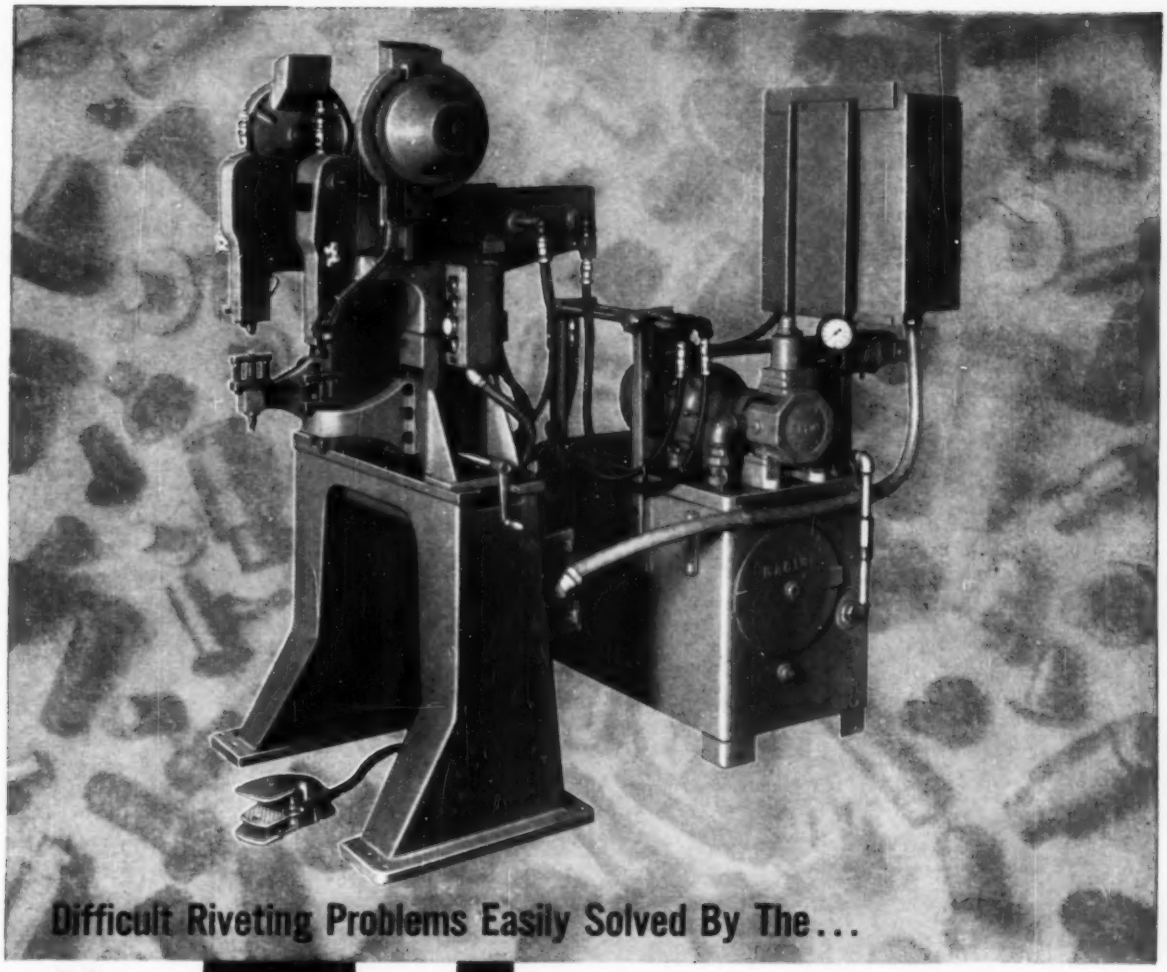
Automatic press unloaders fit in with short runs at Checker Motors Corp, Kalamazoo, Mich, where dies in several large presses must be changed periodically. Because production volume is lower than for Detroit automotive producers, the company must turn out stampings in batches, store them, and shift the presses to other parts for economy and full utility. Even though Sahlin Iron Hands are usually considered equipment for high production, they can be utilized as press unloaders if the part grippers are changed to suit the work each time a die set is changed.

Smaller parts can be stamped two at a time in a large press; if the dies are progressive the parts are manually handled in the press and only extracted automatically from the second die. Larger parts are handled by coupled double grippers sometimes. The extractor can be fitted with an elevating air cylinder that will raise the part higher than the usual extractor capacity, or drop it lower than usual before release.

Die and gripper storage is required for low-production operations, so press time is fully utilized. Batch production allows fast press cycles.



Versatile extractor . . .
Clearing 17500-ton press stamps large roof and floor pans, plus smaller parts that use up full press time. Extractor picks up ejected stampings and dumps them on slat conveyor that leads to trim press



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T-J TOMKINS-JOHNSON

RIVITORS ... AIR AND HYDRAULIC CYLINDERS ... CUTTERS ... CLINCHORS

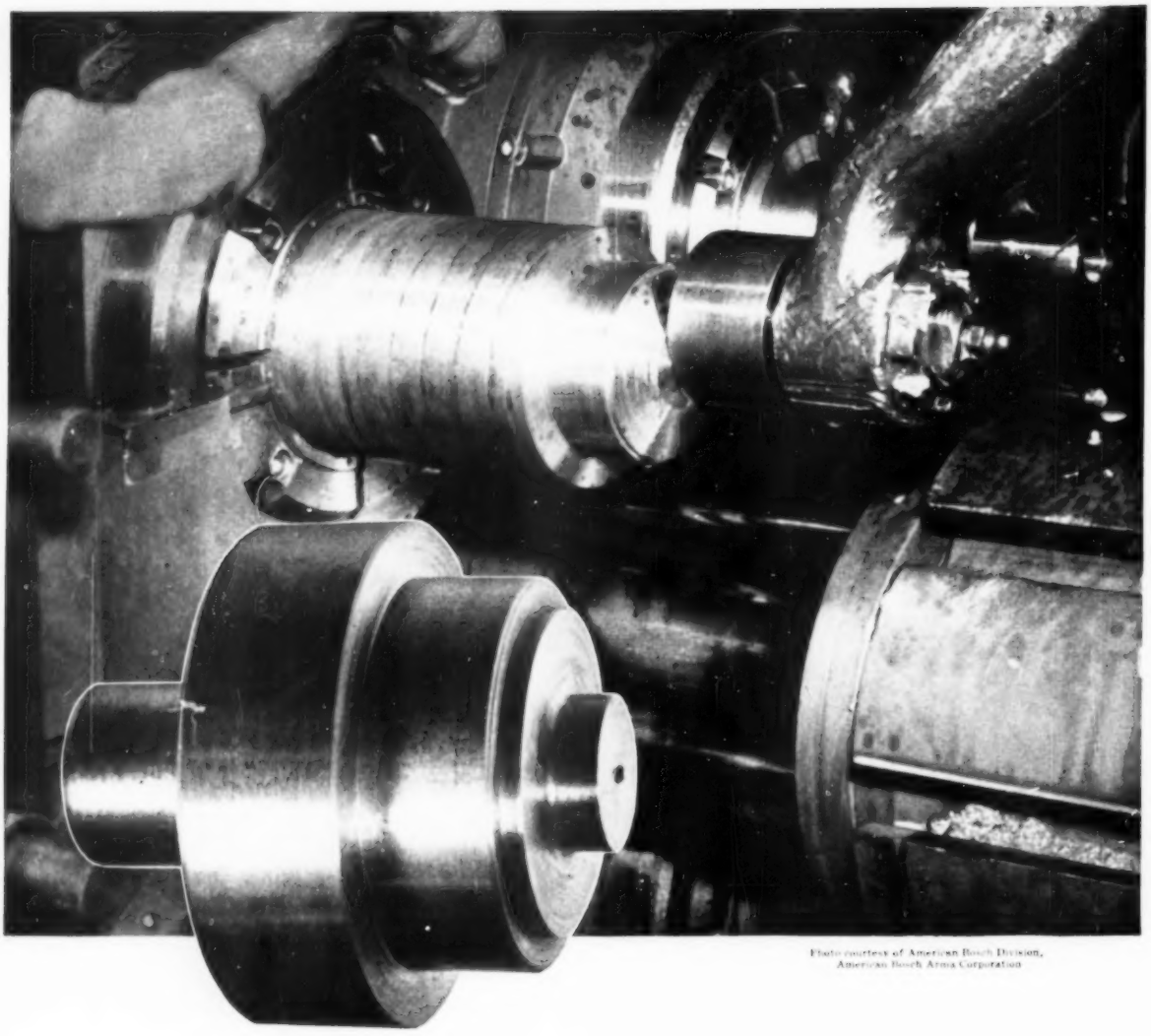


Photo courtesy of American Bosch Division, American Bosch Arma Corporation

Leaded Nitralloy Takes a Big Bite Out of Machining Time!

By switching to Nitralloy Leaded for this hydraulic head, secondary lathe operations and expensive heat treatment were completely eliminated. Produced in a single machining operation, the part is now sent directly to the grinding department. Spindle speeds and feeds were also increased.

For complete information about other fast-machining Aristoloy leaded steels or standard carbon, alloy and stainless grades, call the Copperweld representative in your nearest large city. Or write for booklet entitled, "A Complete Line of Leaded Steels," and NEW PRODUCTS & FACILITIES CATALOG.

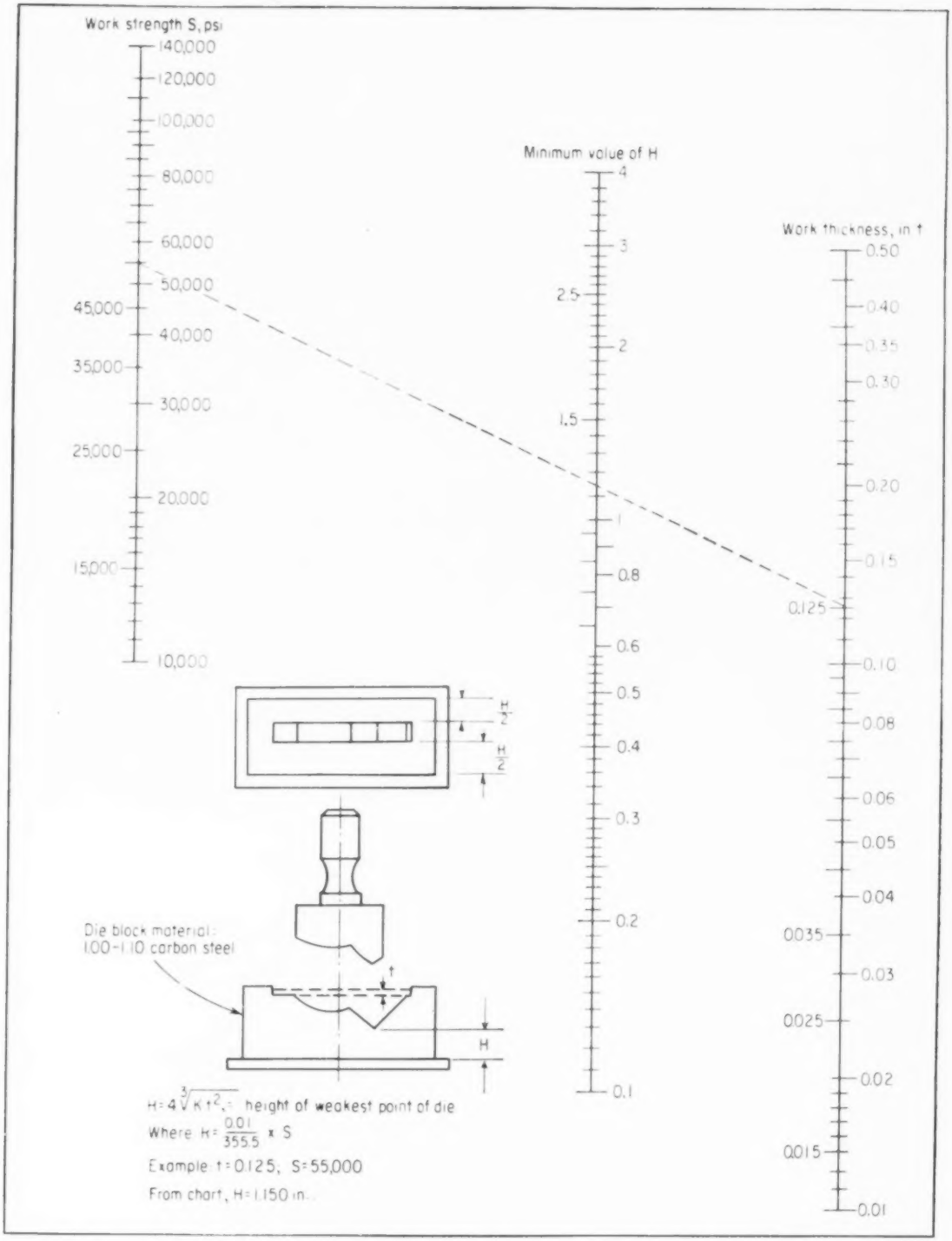
ARISTOLOY STEELS

COPPERWELD STEEL COMPANY

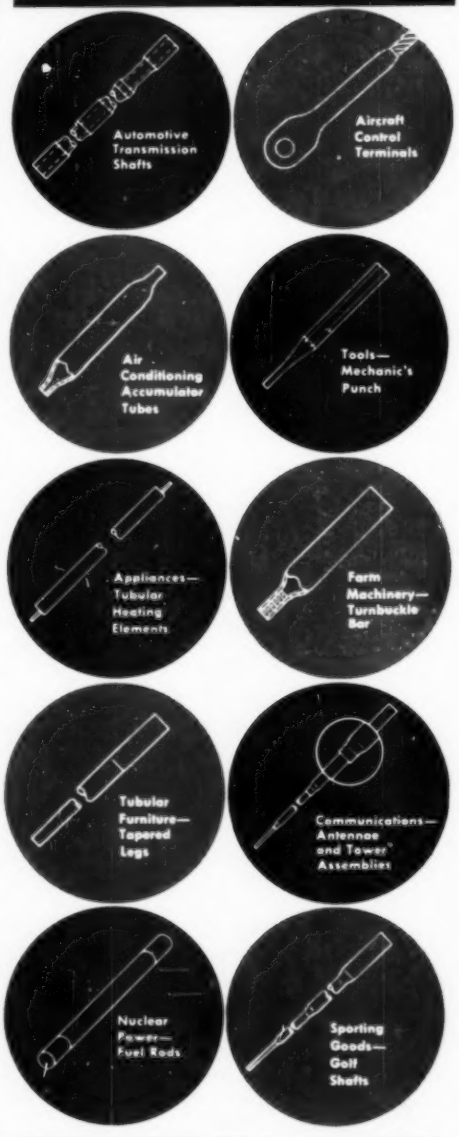
ARISTOLOY STEEL DIVISION • 4009 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

Bending-Die Strength

By Frank J Kuchta, mechanical engineer, J Wiss & Sons Co. Newark, N J



WHAT TORRINGTON ROTARY SWAGING MACHINES CAN DO FOR YOU



These versatile, efficient machines shape metal parts by hammering between dies instead of cutting stock away. They give you a full pound of parts from every pound of metal. They also save you time and labor. Swaging is usually the fastest way to point, taper, reduce or bond metal parts. Tooling is simple and surprisingly inexpensive.

There is no greater authority on swaging than Torrington. Torrington pioneered the swaging process, designed the original equipment and has constantly improved it through innovations in methods and engineering. Today, Torrington operates more swaging machines than any other company in the world. The experience of our engineers is unparalleled. We maintain experimental shops to help you solve your special swaging problems. If you have a part that can be swaged we can design and produce "Job-Tested" dies to your specifications. Come to Torrington with your swaging problems—we have the answers. The Torrington Company, Swaging Machine Division, 200 North St., Torrington, Conn.

TORRINGTON ROTARY SWAGING

SWAGING HEADQUARTERS, U.S.A.

Have you sent for this FREE book and calculator?

Here is a new book, written in simple language, that describes the "Do's" and "Don'ts" in welding USS "T-1" Steel. Included in the booklet is a handy heat input circular computer that helps you choose the proper welding machine settings. Both will help every welder to do a more reliable job and make his work easier.

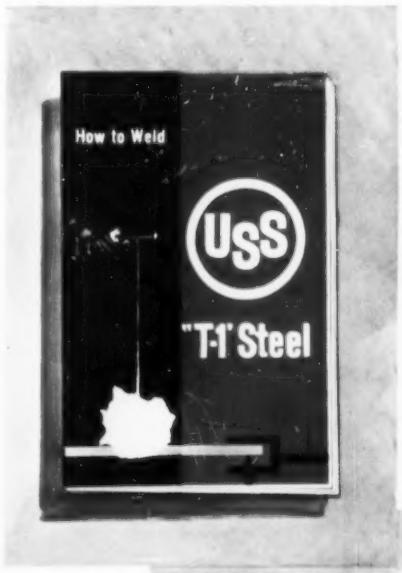
USS "T-1" Steel has become famous for three properties not usually found in a single steel: very high yield strength, excellent toughness and good weldability. The booklet will tell you how to weld "T-1" Steel successfully without affecting either its strength or toughness.

The information is based on the experience of our many field service men whose jobs are to help customers fabricate "T-1" Steel. It contains the results of nine years of work with hundreds of users, and shows how to apply common practices in the welding of "T-1" Steel.

As the booklet points out, welding of USS "T-1" Steel is not particularly difficult—but it is different than welding most other high-strength structural steels. To do it correctly requires some basic knowledge of the metal, of the electrodes, and the proper welding procedures.

We'll gladly send you enough free copies of the booklet for your weld shop personnel. Just send the coupon.

USS and "T-1" are registered trademarks



United States Steel Corporation – Pittsburgh
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Gentlemen:

Please send me _____ copies of your new 24-page booklet, "How to Weld USS 'T-1' Steel," including the handy heat input calculator.

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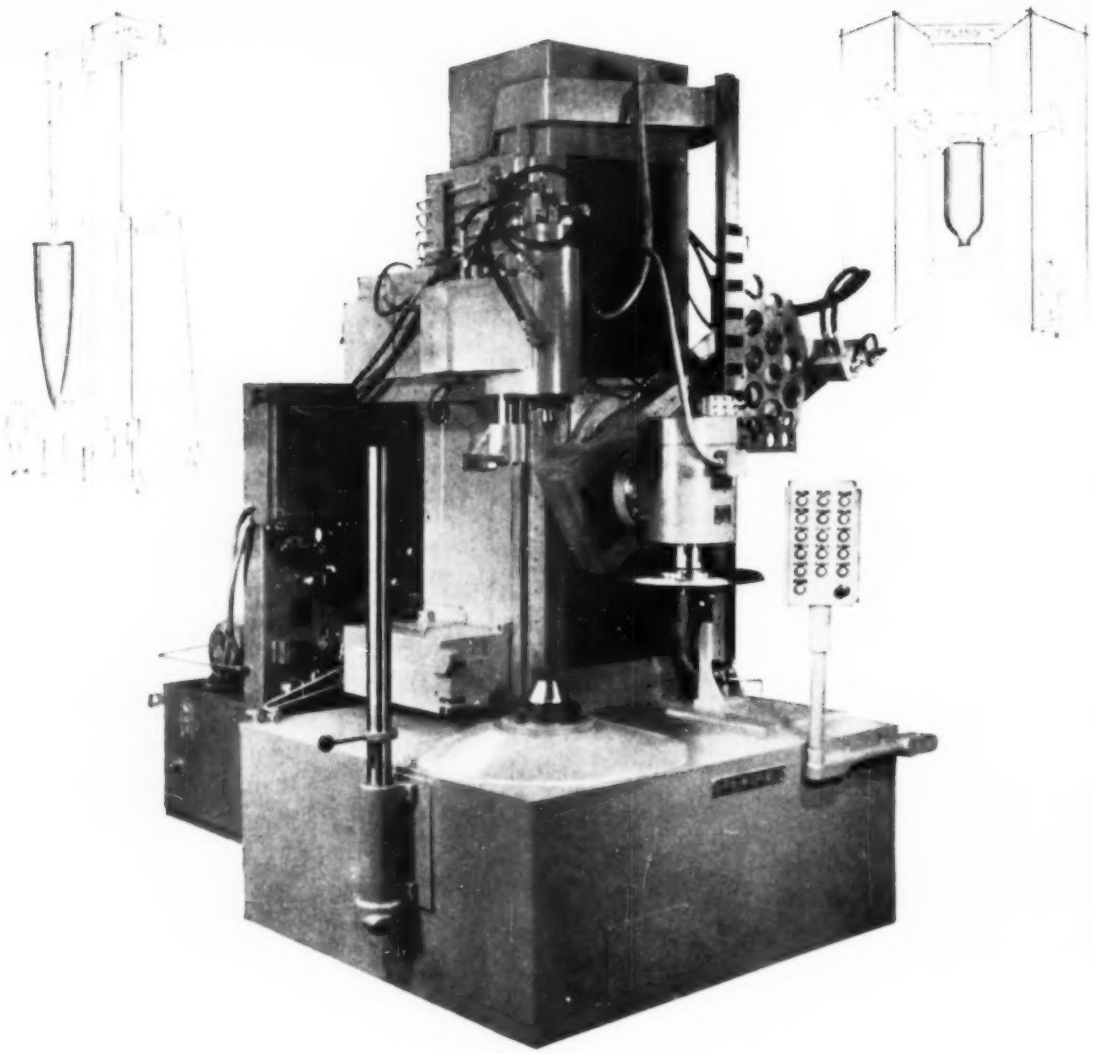


Vertical Grinding missile shapes

If you have anything to do with contoured missile shapes you should find out about this brand new breed of machine —the vertical contour grinder. The machine shown above turns and grinds a laminated missile nose whose surface must be smooth and accurate. The point is, this machine was designed for specific missile requirements, and yours may be similar. In vertical grinding the force of gravity works to help achieve concentricity, uniform wall thickness, accurate interior and exterior contours and extreme micro-inch finish. These grinders are designed especially for ceramic, metal, plastic and combinations of materials. Size and weight of workpiece is not limited.

The Springfield Machine Tool Company pioneered the principle of vertical grinding and was one of the first builders to incorporate the principle of hydraulic contouring in a machine tool. These ideas are found in hundreds of machines bearing the Springfield nameplate, and are your best assurance that we can bring to your problem both experience and imagination. Telephone, telegraph or write for informative literature.

THE SPRINGFIELD MACHINE TOOL CO., SPRINGFIELD, OHIO

SPRINGFIELD

Talking Shop...

The Decade Without A Name

Past decades assume a character which can often be evoked by a simple adjective. Thus Gay defines the Nineties, Roaring the Twenties, and Sober the Thirties. Despite cold war crisis, we will probably recall the Fifties as Flourishing.

What name shall we call the Sixties?

No crystal ball can be clear enough to predict, but there are signs that point clearly to the factors that will determine whether we look back on the Sixties with pleasure or pain. These factors make it plain that, as on a few occasions in the past, a key role in determining the character of the decade ahead will be played by the people in manufacturing engineering.

Before you dismiss this as a Christmas Bouquet for our readers, consider the evidence.

Approaching decades do seem to cast their shadows before. Thus, the year 1929 was filled with portents for those who could read them. By 1939 few could fail to see that World War would dominate the Forties.

As we turn to the Sixties more and more thoughtful people are convinced that it will be a decade of economic competition — competition with allies we have helped make strong and with adversaries we are unable to keep weak. Thus how we remember the next decade will depend on how well we are able to compete. The key to successful competition is often found in manufacturing methods.

Our most obvious competition with Russia is in space and it is in space that we are most obviously not competing yet. Some may share the view of the Little Old Lady who said to one of our astronauts, "We should not be trying to visit the moon. We should stay home and watch TV like the Good Lord intended we should."

That is the speed of technical progress today. TV is already a commonplace and the time when it wasn't with us seems as distant as the horse car. But technical progress is striking a snag. Frank Filippi of Solar Aircraft put it bluntly when he said recently that, "We must recognize that the designer is now at the mercy of the production man." The grim bottleneck in our space program is largely in our ability to produce reliably the designs our space engineers conceive. It is well known that most of our failures at Cape Canaveral are "mechanical failures" rather than "design errors."

This is a polite way of saying that 20 process engineers couldn't find a way to manufacture successfully what 2000 designers thought they had engineered beautifully.

This problem is a challenge of the first magnitude to every man whose job it is to improve manufacturing methods.

Yet when Nikita Khrushchev said to us, "I declare war on you . . . in the world of trade" he was not speaking exclusively, or even primarily of space ships. He meant cars, and appliances, and turbines, and tractors, and machine tools. In this area it is not a question of can we produce, but rather can we produce at a price that will sell?

This, too, will be a challenge to the manufacturing engineer in the sixties.

We will not respond to this challenge by complaining about differences in wage rates here and abroad, or by pointing to the prevalence of coffee breaks. We can only respond by accepting the difference created by the high degree of comfort we have established and developing methods that retain our ability to compete where we still have it, and restore this ability where we have lost it.

It is a challenge that requires a response growing from the manufacturing genius that created interchangeable parts a century ago, the assembly line a half century ago, and automation a decade ago.

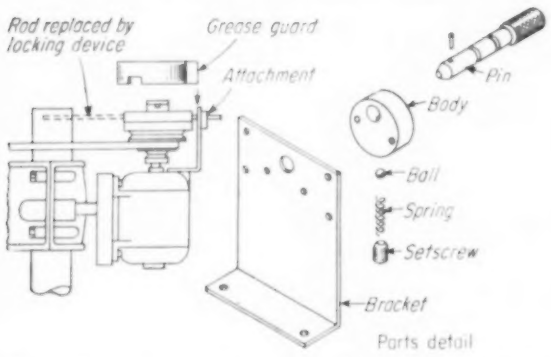
What the answer will be and who will find it, we don't know. We do know that if the answers are found, it will be the manufacturing engineers who will find them. The challenge is to you:

What name shall we call the Sixties?

—*AA*

Practical Ideas...

Lock-Pin Attachment Cuts RPM Change-Over Time



The drillpresses in our instrument shop are equipped with Speed-Gear reducing pulleys which we have fitted with lock-pin attachments for more convenient and efficient operation. This was done because of our need for frequent speed changes. These attachments replace rods used to hold a section of the pulleys stationary while the pulleys' back gears are engaged. Rod is shown in broken lines in assembly sketch.

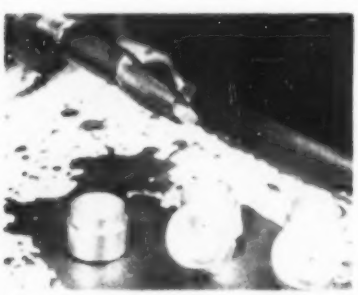
When changing spindle speeds from direct drive to back gears, it used to be necessary to insert a rod and allow it to rest against a stationary part of the machine. This would usually be the drillpress column or a slotted plate fastened in a convenient spot if the column was too short to serve as stop. Changing back to direct drive would require removal of the rod with the added chance of its getting misplaced in the shuffle.

The attachment I designed completely does away with the rod, but makes use of its mounting hole to receive the locking pin. Carried on angle bracket, the pin extends and retracts with a spring-loaded ball click-stop arrangement. The bracket also carries a sheet-metal band which surrounds the pulley at the point where the two sections join. This prevents grease, sometimes leaking from the joint during operation, from being sprayed over the operator.

Methods of mounting the bracket, so it will stand vertically adjacent to the pulley, vary with the construction of the motor. We found it convenient to secure the bracket on top of the inspection plate with a pair of screws slightly longer than those supplied with the motor. Otherwise the bell-housing draw bolts can be used to hold a mounting plate, or the bell housing itself may be drilled and tapped for direct installation.

Now when the job requires speed reduction, the locking pin is merely pushed in to engage the hole in the back-gear section of the pulley. The second step—and this is necessary whether rod or lockpin attachment is used—is to rotate a key, located top center of the pulley, a quarter turn to engage the back gears. Again rotating the key a quarter turn and pulling the pin out returns the pulley to direct drive.

DeWayne Myers, Bartlesville, Okla



End-Mill Turret-Lathe Tool

The possibilities of using end-mill cutters are sometimes overlooked in making turret-lathe setups. Two-fluted cutters can easily be made into forming tools of various shapes and sizes. And when left as is, can produce nicely finished flat bottoms on blind hole work in many different types of materials.

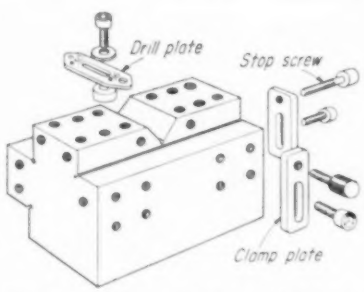
Shown in the photo are a number of small aluminum cells which were drilled, bottomed with the end mill shown, and then bored to finsh ID size. We have achieved equally good results with similar setups on steel-screw stock and free-machining brass.

H J Gerber, Stillwater, Okla

Jig Block Handles Small-Part Drilling

The occasional small-lot drilling job is greatly simplified with a jig block such as the one illustrated. It does a fine job of replacing a drill jig when the quantity of parts involved doesn't warrant the cost of tool construction. And with its stops and guides, this block will equal accuracy and speed of production obtained with any non-automated drill jig.

Steps are milled on three corners and a V across one side to accommodate various-size work ranging from ¼, or less, to ¾ in. However, these capacities can be increased even further with proper spacers under guide plates and clamps. Rows of holes on either side of the steps, or work nests, are drilled and tapped for 10-32 socket-head capscrews. Thus locations are provided for mounting guides and clamps in any position. Mounting holes for attaching the stops are placed in the ends of the block adjacent to the work nests.



The drill-guide plates are made from ⅛ x ½-in. oil hardening stock in the double-ended shape shown to carry two guide sizes. We prepare these plates in blank form after which we drill, mark, harden, and grind them as needed. Clamp and stop plates are made of heavier material so full threads can be produced in the round holes for the clamping and stop screws.

Karl Haller, Millington, NJ

Knee Miller Forms Coils In Tubular and Flat Stock

Inexpensive and accurate coiling and rolling is done by simple tooling on an old No. 2 knee miller in our shop. Most of our work is for prototypes, so tooling expenses have to be reasonable. And we have found that mandrel rolling is not dependable for accuracy. Both of these problems are met by the miller attachment.

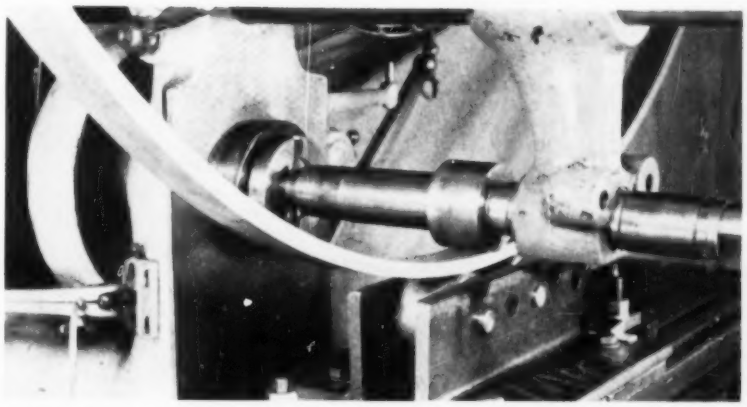
The coiler consists of a keyed powered roll on the miller spindle, plus an adjustable base with two idlers that is bolted to the machine table. The powered roll is supported by the overarm for rigidity, though it can be mounted inboard or outboard, depending on the size of the job. The idlers are bushed in Oilite bearings and run on standard ¾-in. hardened dowel pins. The pins can be pulled and re-inserted to adjust the spacing between idler rollers according to holes drilled through the sides of the adjustable base. With the idlers closer together, there is less stress on the miller spindle.

Coil curvature is controlled by idler spacing and by elevating the miller knee. We often start a job by rolling the stock back and forth at slow speed, by reversing the spindle rotation. We bring up the miller knee slowly until the required curvature is produced.

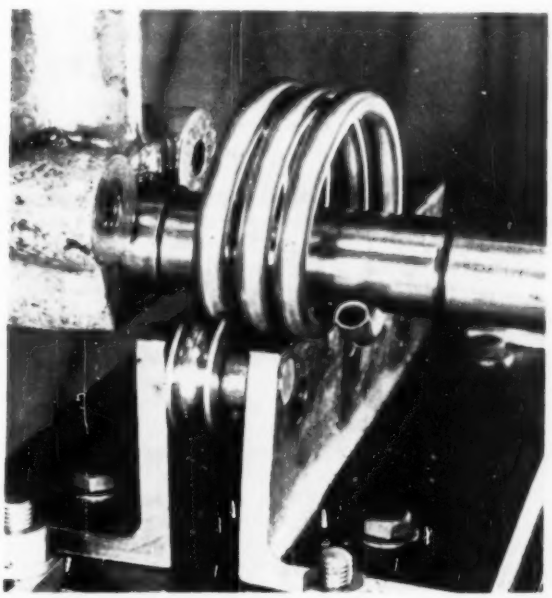
For most jobs a set of rollers with about an OD of 3 in. is right, though this varies between materials. Table and cross-slide are locked during rolling.

The equipment produces accurate coils for heat exchangers in copper, stainless steel, and carbon steel, wound to small diameters and to close pitches. Some jobs require formed rollers, as illustrated, to avoid collapsing the tubes. Other jobs in flat stock can be handled with flat rollers.

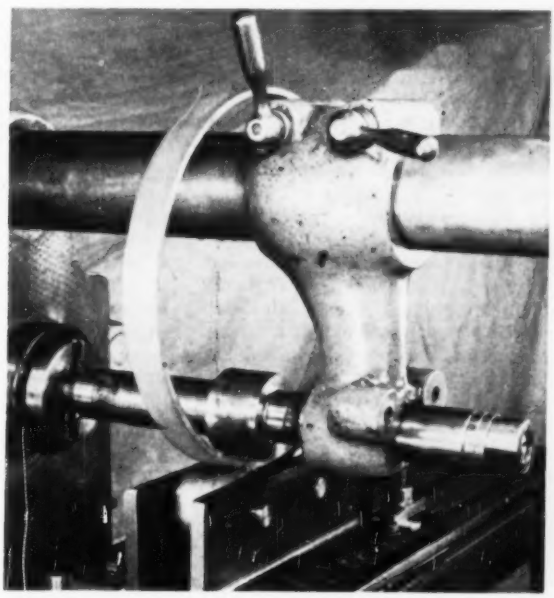
Boris T Smirnoff, production engineer, Nuclear Development Corp of America, White Plains, N Y



Large ring . . .
Four-ft ring of aluminum stock 1½ x ½ in. is rolled with rollers set at the same position as for the small ring, but with more space between the spindle and table

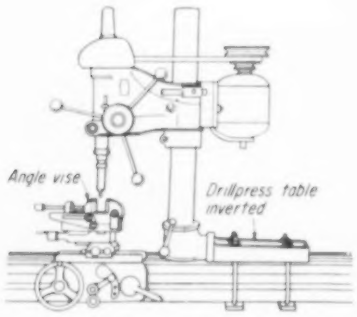


Coils . . .
Flanged rollers grip tube stock to form tight coils. Stock has ½-in. OD and 0.065-in. wall. Note distortion-free coil end



Small ring . . .
Flat rollers form 12-in.-dia coil in stock 1½ x 3/16 in. Ring is being re-rolled after it has been welded together

Practical Ideas...



Emergency Milling Setup Mounts on Lathe

I had a simple but urgent milling job to do when it became obvious that there wasn't a machine to be had. All were occupied with other important work not to be interrupted, which left me only one alternative, that of improvising.

In laying my plans for substitution, I needed a powered spindle capable of carrying a cutter and a workholder with two-directional feeds. The first requirement was satisfied with a drillpress and its motor drive. The lathe carriage with its cross-slide feed and the compound set at right angle to the cross slide filled the bill for my workholder support.

My next step was to combine the two components. This I did by removing the drillpress base and inverting the table so its machined surface faced down and away from the drill head. In this way I was able to bolt the table to the lathe bed with two long bolts through the table slots and a strap across the bottom.

Because some of the work had to be machined at various angles, I mounted an angle vise on the compound as my workholders for these and other operations. Lowering the drill head as far as permissible eliminated an over-extended quill which would have caused strain, side play, and chatter.

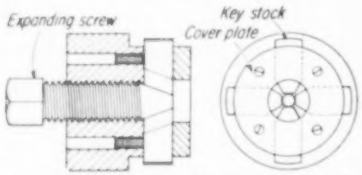
No great imagination is necessary to recognize that this arrangement can be adopted for other useful operations in emergencies. One such application could be for milling parts gripped in the lathe chuck during either hand or power rotation and also for indexing.

M B Therein, Ottawa, Canada

Expanding Plug Braces Thin-Wall Parts

A second operation in the production of bearing retainers involved facing a rectangular flange at one end. Previously machined were the ID and the OD, which resulted in a wall thickness too thin to be gripped in our turret-lathe collets without the danger of partial collapse of the wall. The tool shown was therefore designed to brace the parts from within so full collet pressure could be applied.

The job of constructing the expanding plug is a simple one. After machining the body in two diameters, the largest to suit a 2-in. collet and the smaller to clear the ID of the workpiece, a hole is drilled and tapped for a ½-in. screw. This done, two ⅜-in. slots are milled across



the small-end face to a depth of ⅜ in. A retainer plate is then machined to the smaller body diameter after which it is bored with a clearance hole and drilled to be screwed onto the body.

Four pieces of ⅜-in. key stock are cut and finished with a 20° bevel at one end to serve as jaws. The bevel ends are the contact faces against which an expanding screw bears. This screw is made from a square-head setscrew, its point ground to a 40° included angle.

Before the projecting jaws can be machined after assembly, it is necessary to lock them in position. This we do with 10-24 headless setscrews in holes drilled and tapped from the back of the plug. Once locked, with equal tension on the locking screws, the expansion screw is tightened enough to exert pressure on all four jaws. The jaws secured, the plug is again chucked and the projecting jaws are turned to the same diameter as the ID of the workpiece.

In use, insert the plug into the piece and turn the expanding screw until jaws grip the ID. Then insert the assembly into the collet, plug first.

Robert E Kiel, Sheboygan, Wis

Ralph Whitney
Framingham, Mass

WON

$25 **In addition to regular payment for his idea:**

RUBBER ANCHORS
COLLET STOP

in the Oct 19, 1959 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

PAYMENT—$25 in addition to regular rates for the items published to be paid as soon as reader votes are received—usualy three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

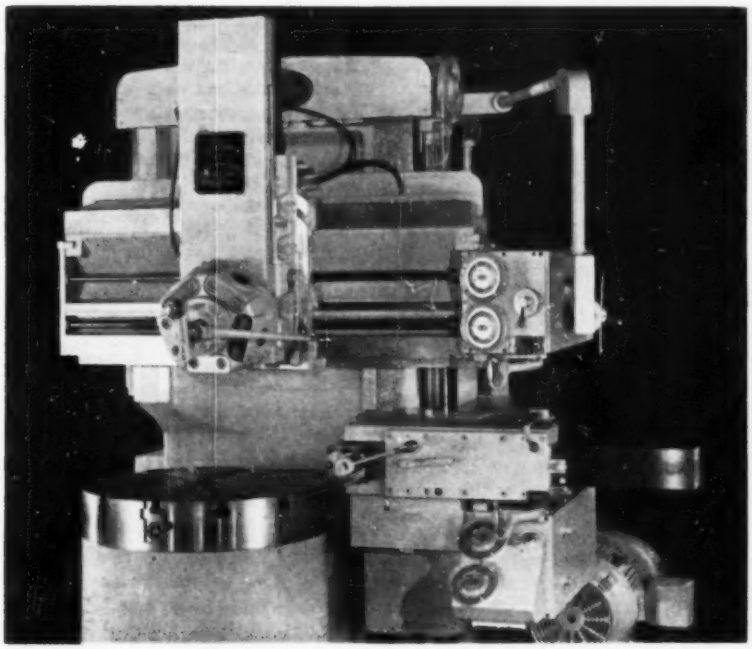
JUDGES—A group of 200 *American Machinist*. readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

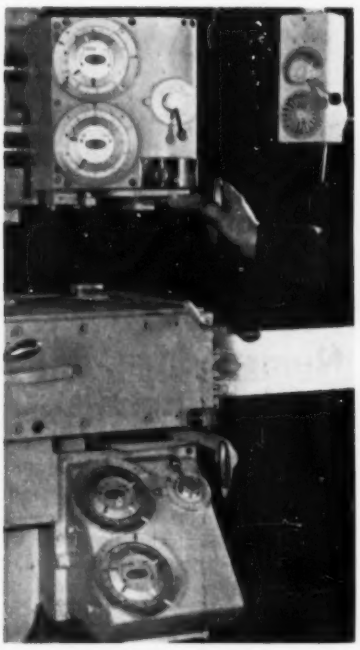
REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers wil judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. **Suggest to your employees** that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N.Y.

New Shop Equipment
Materials and Parts





Bullard Offers Power Controlled Vertical Turret Lathes

Dynatrol series of Bullard vertical turret lathes, available in nine sizes with 26 to 124 in. diameter tables, is reported to be the first VTL line ever built with complete power controls.

Two advances in these lathes are: single-lever control which positions the heads and engages or disengages the tools; infinitely variable feed rates coupled directly to table rpm.

In the smaller lathes, the single-lever control (right) consists of a horizontally swinging arm with a pistol grip which is turned to select the direction of traverse. The grip can be pointed left, right, up, down or a 45° angle. After traverse direction has been set, the operator swings the arm to the left to activate the head traverse. Traverse can be varied from 0 to 9 fpm, depending on the distance the lever is moved to the left. Feed is engaged by swinging the arm all the way to the right. Table speed change, start and stop are controlled from the pendant on the right of the machine.

In the larger machines, the heads are operated by a control box small enough to fit into the operator's palm. The box contains a push-button to start or stop the table, four buttons to select the direction of head traverse, and a lever which traverses the head when moved to the left and engages the feed when moved to the right. The directional buttons for up, down, right or left are arranged in a diamond pattern. By pressing two adjoining buttons simultaneously, the operator can move the head at a 45° angle. The traverse lever can be set for rates of 9 fpm, 4 fpm, 1 ipm and inching.

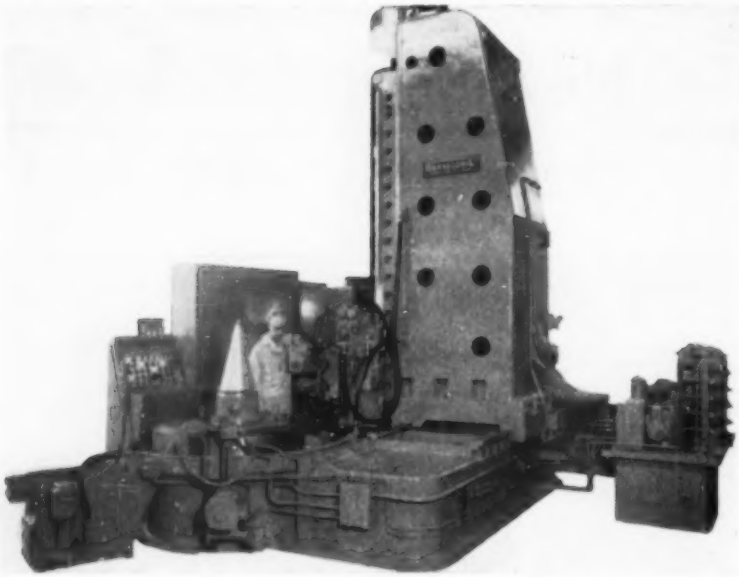
Feed rates on all the new units are infinitely variable instead of the conventional step-by-step. The rate of feed can be changed during a cut, without stopping the table, by turning the direct-reading feed-rate dial.

The measuring system uses large clock-type dials with dual pointers, which rotate while the numbers and graduations remain stationary. One pointer registers tenths of an inch, the other thousandths. When positioning the heads, the operator can watch the movement of the pointers rather than the tool and slow down and stop the traverse as the pointers reach the proper reading. A similar dial measures the progress of the cut and indicates when the feed should be disengaged.

Machines in the Dynatrol VTL line can also be equipped with Man-Au-Trol for pre-programmed automatic operation or with point-to-point or continuous path numerical control systems. Other accessories include Size-Au-Trol for accurate positioning of all heads; hydraulic, electronic or electro-hydraulic contouring attachments; four or five-sided indexing turret heads; thread-cutting, drum-scoring and angle-turning attachments and power-operated chucks.

Bullard Co, Bridgeport 9, Conn

MORE DATA? Circle 51, inside back cover



Numerically Controlled Four-Axis Drilling Machine Handles Cylinders, Cones, Ogives

Numerically controlled Barnes Drill drilling machine can program four motions, two more than previous models. The horizontal two-spindle drilling machine can drill and tap cylindrical sections with 36-in. maximum diameters and 72 in. maximum height, conical sections, and ogival sections (non-linear nose cones).

The machine performs straight drilling, reaming, counterboring, countersinking and tapping; combination drilling and countersinking; combination drilling and counterboring. It uses vertical spindle movement with air counterbalance, in-and-out 24 in. column travel, and a 40 in. rotary table. Powered by a ¾-hp motor, the table can be indexed through 360° from the given reference point at 1.25 rpm.

A standard eight-channel Flex-O-Writer tape supplies the information to the positioning control. Machine controls also supply instructions for machine and operator. Instruction lights indicate when tool changes are required for the various operations and the machine will not operate unless the proper tool is in the spindle and all other tools are located correctly in the six-position tool board. Machine instructions include coolant selection, on-off, rapid approach and sensing. A sensing device senses the depth of the tool from the face of the work.

All positioning of machine and operator and machine instructions are performed simultaneously from the taped information. When the conditions set up on the tape have been satisfied, the control supplies a signal which starts the operation after rotary position has been checked automatically. When all the holes in one row have been completed, the tape positions the spindle vertically, rotates the table, moves the column.

Barnes Drill Co, 830 Chestnut St, Rockford, Ill

MORE DATA? Circle 52, inside back cover

Dow Adds Cold-Bending Sheet To Magnesium Mill Products Line

Special bending sheet is designed for applications which require good cold-bending characteristics at room temperature. Critical bends can be easily formed cold, eliminating need for heated dies in many cases.

Material can be bent without cracking at room temperature through an angle of 90° around a mandrel radius equal to the bend factor times the nominal sheet thickness. Bends can be made either parallel or perpendicular to the direction of rolling. Company guarantees the following bend factors: nominal sheet thickness, 0.040-0.100 in., 2.0 t perpendicular, 2.5 t parallel; 0.101-0.190 in., 2.5 t and 3.0 t. These bend factors are based on acceptance testing procedure using 6-in.-wide specimens in a press brake with steel mandrels and a rectangular retaining die. Sheet is produced from coils of AZ31B-O alloy.

Dow Metal Products Co, Div of Dow Chemical Co, Midland, Mich

MORE DATA? Circle 53, inside back cover

New Boring Head Incorporates Piloted Interchangeable Shank

No. 50's body is made from a single solid piece of steel with its 3-position tool block designed with a larger, sturdier, adjustable dovetail precision ground and hardened. Two additional clamping screws are arranged so that all cutting strain is

HEAVY-DUTY BAR BILLET SHEAR with completely automatic operation has capacity to shear 4-in. crs—SAE 5140, 115,000 tensile strength bars. It is rated at 700 tons, 1.9 in. up at point of shear. Production rate is 32 strokes per minute with 4-in. stroke at point of shear. It will process billets up to 6 in. long at this speed or an 8-in. long billet at 25 spm. Shear cut length tolerance is ± 0.020 in.—*Verson Allsteel Press Co, 9300 S Kenwood Ave, Chicago 19, Ill*

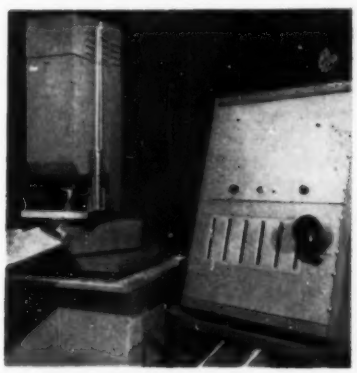
MORE DATA? Circle 54, inside back cover

against solid metal. By adjusting these screws, pressure is exerted directly on the dovetail to any desired tension.

Interchangeable piloted shank assures concentricity of the tool holder and permits every shank to fit every other tool. Adjusting screw nut has a collet split so that adjustments for wear can be made without dismantling the tool. Boring head will take both ½-in. (Model 50) and ⅜-in. (Model 50A) round tools. Heads are also available for tool sizes from ⅜ to 1½ in. in standard units and up to 3 in. in specials.

Maxwell Industries Inc, 49 E 5th Ave, Ashtabula, Ohio

MORE DATA? Circle 55, inside back cover



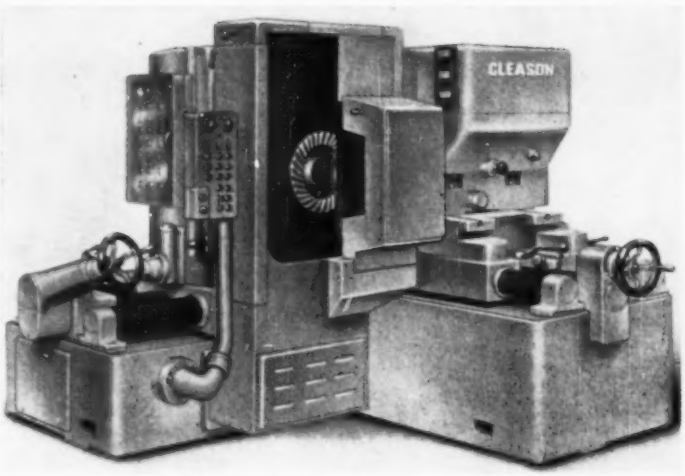
New Fringecount Micrometer Direct-Measures to 0.000001 in.

Model 214 for direct measurements to one millionth of an inch is a combined interferometer and bi-directional counter for ultra precision in linear measurements. Using the wave length of light in combination with the dc coupled, non-ambiguous bi-directional counter greatly reduces uncertainty in accuracy of the masters. Measuring range is zero to 2 in. By using interchangeable counterbalance weights, the measuring force of the spindle tip can be varied from 1 to 16 oz.

Included in improvements on the instrument are a non-wringing anvil for gage block calibration; a removable plastic stabilization enclosure which reduces interior temperature fluctuations that are cuased by ambient temperature variations; and an accessory for remote handling of parts being measured. Sensitivity of reading exceeds three tenths of a millionth of an inch (0.0000003 in.). Accessories for adapting the Model 214 to routine measuring problems are provided.

Link Aviation Inc, Binghamton, NY

MORE DATA? Circle 56, inside back cover



Automatic Lapping Machine Laps Spiral, Bevel and Hypoid Gears up to 36-in. Dia

Automatic lapping machine can lap spiral, bevel and hypoid gears up to 36 in. dia with shaft angles from 10 to 130°.

While lapping compound is pumped on the gear pair, the relative position of gear and pinion is continually changed to lap all tooth surfaces. Servo-controlled lapping motions and variable spindle speeds from 200 to 2000 rpm allow extended control of tooth bearing surface.

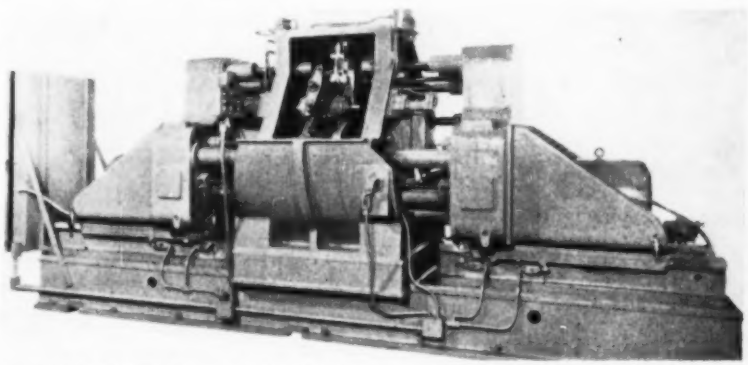
A swinging motion of the pinion head sweeps the bearing along the length of the tooth. A lateral motion of the gear head moves the bearing up and down the tooth profile, while a lateral pinion head motion maintains uniform backlash. Lapping time for any portion of the tooth is simply set on a dial.

Machine features include an automatic backlash mechanism which maintains the same lash from pair to pair regardless of dimensional differences. All gears are lapped with the lash they will have in final assembly.

The operator pushes one button to withdraw the pinion head for chucking and another to advance the work to operating position, close the lapping guards, and start the lapping cycle.

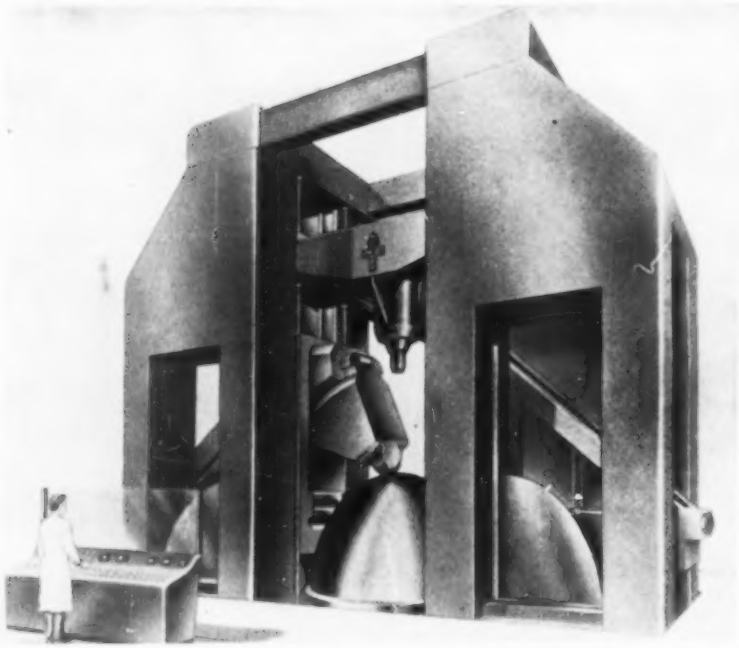
Gleason Works, 1000 University Ave, Rochester, NY

MORE DATA? Circle 57, inside back cover



STEEL FORGINGS have a pair of holes automatically drilled, bored, and milled by Model 2-HWT-240 high production machine at rate of 158 forgings per hr. The two-way heavy-duty revolving trunnion type machine utilizes a 6-station automatic index in conjunction with two opposing Morris 24-in. way-type hydraulic slide units. Two parts (flange yokes for universal joints) are processed in each fixture—*Morris Machine Tool Co, 2011 Eastern Ave, Cincinnati 2, Ohio*

MORE DATA? Circle 58, inside back cover



120-INCH SHEAR FORMING MACHINE, called Spin Forge, can form missile components up to 10 ft diameter and 24 ft long. When completed, the machine will measure 38 ft high, 37 ft wide and 22 ft deep and will weigh 600,000 lbs. It can produce mechanically spun sections in conical, tubular or parabolic configurations with varying wall thicknesses—*Hufford Div, Siegler Corp, El Segundo, Calif*

MORE DATA? Circle 59, inside back cover

Tantalum-Tungsten Alloys Offered With Super High Melting Points

Tantalum-tungsten alloys developed by Stauffer-Temescal Co have melting points which range between 5430 and 6150 F, the melting points of pure tungsten and pure tantalum. Tensile strength of worked 90% tantalum, 10% tungsten alloy is 150,000 psi at room temperature. At 4500 F tensile strength is still about 15,000 psi.

Because of exceptional purity imparted to the alloys by electron-beam melting, ingots can be worked and fabricated with conventional steel mill equipment and techniques and can be machined by standard tools. This, together with the fact that scraps can be directly recycled through the furnace, permits production of finished shapes at relatively low cost. Alloys are now being produced in 5-in.-dia ingots up to 42 in. long, and in fabricated forms or sheet to order.

Stauffer Chemical Co, 380 Madison Ave, New York 17, NY

MORE DATA? Circle 62, inside back cover

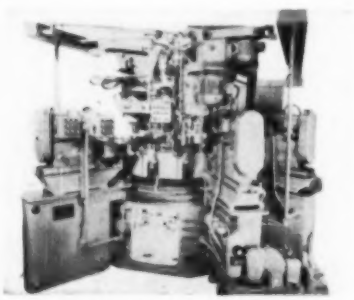
Dual Spindle Tube Expansion Unit Rolls Up to 30 Tubes per Minute

Pneumatically operated tool combines two Model 1000 Airetrol controls into one operating unit and makes possible the rolling of approx 1800 tubes per hr, depending on speed of the motor used. The Dual Airetrol automatically controls tube expansion by precise measurement of torque output and is accurate to 0.001 of an inch. Finger-tip micrometer adjustment can be set to the desired torque; calibrated ring permits setting as low as 0.5 ft-lb and up to 37 ft-lb torque at 90 psi.

Unit, which will roll tubes ranging in size from ½ to 1 in., operates at 1500 rpm and can also be obtained in models that run at speeds of 700, 550, and 400 rpm. Supporting ring on the housing permits overhead suspension.

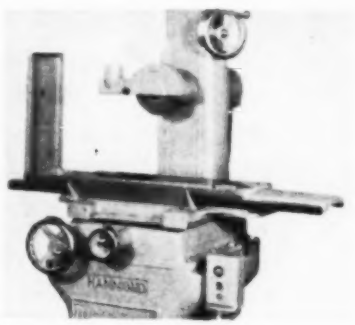
Airetool Mfg Co, Springfield, Ohio

MORE DATA? Circle 60, inside back cover



COMPRESSOR HEADS have 41 operations performed on them automatically by Morris High Production Machine, Model 394-8. The horizontal rotary indexing machine utilizes a 48-in.-dia table and a 10-station automatic hydraulic index to drill, ream, spotface, chamfer, and mill 375 pieces per hr. Cycle time is 9.6 seconds—*Morris Machine Tool Co, 2011 Eastern Ave, Cincinnati 2, Ohio*

MORE DATA? Circle 61, inside back cover



Foote-Burt Improves Its No. 2 Hammond Surface Grinder

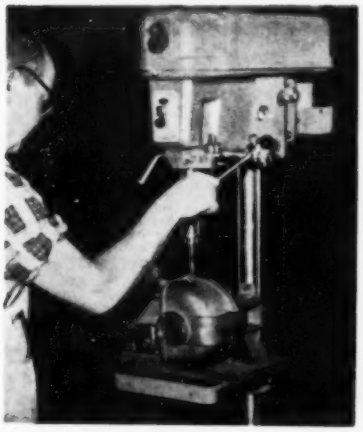
Redesigned Footburt-Hammond No. 2 is a high precision hand-feed toolroom grinder developed specifically for fine grinding. Pushbutton station has been moved from the column to the front side of the base where operator can use it without reaching over the table. High accuracy is built into the machine by double-dovetail design of the spindle carrier. Both dovetails are equipped with adjustable gibs to retain accuracy between carrier and column. Spindle is direct motor driven and is mounted on precision preloaded ball bearings. Spindle assembly with the motor is mounted in the spindle carrier as a unit. Ex-Cell-O spindle assembly is standard but others are available. Total vertical spindle adjustment is 10¾ in. Max

wheel size is 7 x ½ in.

Table has working surface of 6 x 18 in. In-and-out movement is 6½ in. Longitudinal table travel is 18 in.; it is operated by roller-chain drive. Chain is anchored to the table at each end and passes over two idlers and around a sprocket on the handwheel. Chain drive provides smooth table travel and eliminates the grinding pattern frequently seen when rack and pinion drive is used.

Foote-Burt Co, Cleveland 8, Ohio

MORE DATA, Circle 63, inside back cover



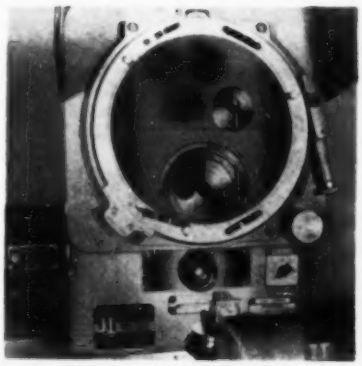
Rockwell Introduces New Line Of 15-in. Drillpresses

Line includes 40 models available with high or low speed, single or multiple spindle, No. 2 Morse taper or 0-½-in. key chuck spindle, and standard or production table. In addition, components of the press may be obtained for making up special purpose equipment. Features include four over-sized, pre-loaded, lifetime-lubricated ball bearings incorporated in the spindle construction. Heavyweight head, cast in a single piece, and large 2-in.-dia quill provide rigidity and long life. Multiple-spline floating drive minimizes vibration.

Slow and high-speed models offer a range of 470 to 4600 rpm with choice of four speeds in each model. Multi-speed attachment permits even wider ranges for such special operations as reaming at slow speeds and small hole drilling at high speeds. Unit is powered by a 1/3 or ½-hp motor. Spindle travel is 4-5/16 in. Price of single-spindle models ranges from $144.50 to $186.50 without motor.

Rockwell Mfg Co, Walker-Turner Div, 400 N Lexington Ave, Pittsburgh 8, Penna

MORE DATA? Circle 64, inside back cover



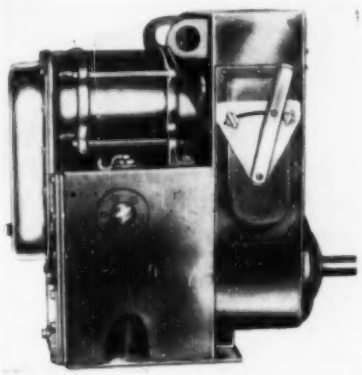
Reflection Inspection Device For J & L Optical Comparators

Normal Reflection Unit for all FC-14 and TC-14 comparators is designed to produce the max amount of reflectivity, regardless of the surface finish of the part being inspected. It is claimed that even superficial surface scratches can be checked accurately.

A front surface, spherical reflector adds at least 55% to the effective light given by a 1200-w lamp. Entire unit is externally mounted. All heat is dissipated before entering the optical system of the comparator; Pyrex lens in the unit prevents breakage due to shock. Depth of focus of up to 0.100 in. can be obtained and image does not change size during focusing. High-intensity unit is not limited to low magnification projection lenses. Even metallographs can be taken, at 50X, to determine depth of carbonization and grain structure.

Jones & Lamson Machine Co, Springfield, Vt

MORE DATA? Circle 65, inside back cover



Hydraulic Transmission With Motor Gives Speeds From 0-350 rpm

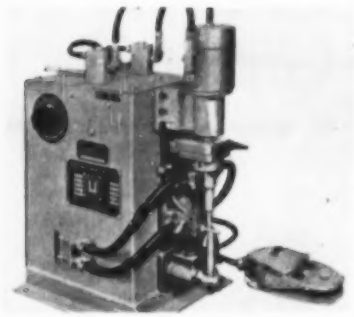
New 1½-hp transmission provides infinitely adjustable speeds in either direction. Forward and reverse speeds can be set identical or different. Additional features include instantaneous reversing, neutral (0 rpm) position, and integral torque multiplier for high torque applications. Self-contained package unit is furnished with 6-qt oil reservoir.

Roberts Mfg Co, 849 W Grand Ave, Chicago 22, Ill

MORE DATA? Circle 66, inside back cover

600-TON CAPACITY HYDRAULIC GAP PRESS is being used primarily for flanging barge floor beams, bilge, headlong, and stern plates for an Indiana barge builder. Steel plate worked ranges from 5/16 to 5/8 in. depending on the part, and flanging radii vary from ⅝ in. for floor beams to 6 in. for bilge plates. Lengths range up to 36 ft. Fast advance and return speeds are 70 ipm with pressing speed 35 ipm. Press stands over 16 ft above floor level, has bed area of 30 x 438-in.—*Verson Allsteel Press Co, 1335 E 93rd St, Chicago 19, Ill*

MORE DATA? Circle 67, inside back cover



Bench Welder Offered For Fine, Critical Work

Available in models with capacities from 5 to 50 kva, machine is one of a new line of single-phase welders developed for resistance welding of all types of metals to meet rigid specifications.

Air-actuated unit has adjustable upper and lower arms and holders and is equipped with a foot switch. Light-metal ram operating in a lineal ball bearing sleeve and precision diaphragm cylinder provide the machine with special adaptability for extra fine welding work.

Universal Electroweld Div, Electric Arc Inc, 152-1 Jelliff Ave, Newark 8, NJ

MORE DATA? Circle 68, inside back cover

Spherical Bearings Use Teflon Bonded to Metal

Self-aligning spherical bearings, with Teflon bonded to the outer raceway, have a coefficient of friction of 0.4. The bearings can be used for low surface speeds, high unit loads or in applications which are subject to high dynamic loading where metal-to-metal life is limited by fretting or brinelling.

According to the manufacturer, Teflon spherical bearings have 10 times the life of conventional bronze or steel-on-steel bearings. In tests, the RSST-6 bearing with ⅜ in. bore showed a wear characteristic of 0.00035 under a 2200 lb constant load at 50° oscillation, 13° per second for 50,000 cycles.

Radial Bearing Corp, Taylor St, Danbury, Conn

MORE DATA? Circle 69, inside back cover

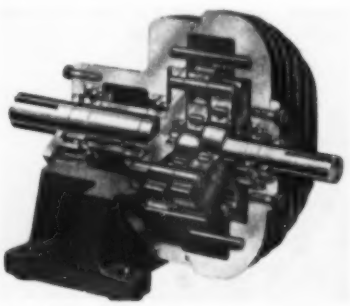
Cutter Grinding Fixture Designed For Horizontal Surface Grinders

Fixture enables operator to grind and sharpen plain milling cutters up to 6 in. in dia on a horizontal surface grinder. In many cases it will eliminate need for a universal tool and cutter grinding machine, manufacturer claims.

Unit is a Meehanite casting with all working surfaces hardened and ground. Base is 4 in. sq; over-all height is 6 in.; weight is 5 lb; price is $42.50. It will hold cutters up to 6 in. in dia and with bores of ⅞, 1 and 1¼-in. size.

Montgomery & Co, 401 Morris Ave, Springfield, NJ

MORE DATA? Circle 70, inside back cover



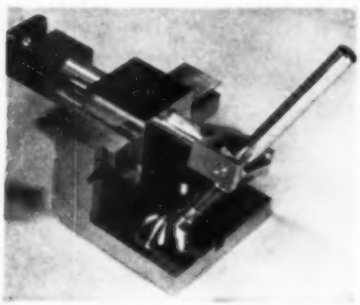
Black Tool Introduces Cycloid Reduction Drive

As a result of cycloid design, these Hi-Range drivers are 40% to 60% smaller than other types of reducers with comparable ratings. They are reported to provide a wider range of torque than other types and, pound for pound, a higher torque, ranging from about 30 in.-lb torque per pound of reducer weight to over 80 in.-lb.

Drives provide a particularly wide selection of ratios. They are particularly adaptable to special applications and to integral design, especially where weight or space, or both, are important. Sizes vary from small units for instruments to drives for large machine tools.

Black Tool Inc, 1924 S Navajo St Denver 23, Colo

MORE DATA? Circle 71, inside back



Gage Sets Up Compound Angles Directly From Blueprints

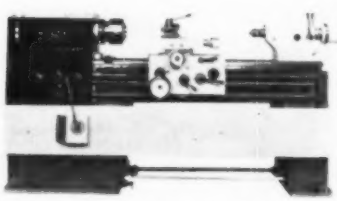
Compound angle setup gage enables an operator to set the angles as he reads them from the blueprints. Computations are eliminated and all angular settings are tabulated in one minute increments.

Gage blocks are used to set the indicator rod, which rides on a fixed hemispherical surface, to the proper compound angle. The gage, which can also be used to locate a bore or hole, will work in conjunction with any workholding device.

The base measures 3 x 3⅛ and height is 5¾ in. Angles to 45° may be set simultaneously in both planes. Toolroom gage is accurate to 3 min at maximum angle; inspection model is accurate to 1 min at maximum angle.

Demill Co, 23690 Effingham, Cleveland 17, Ohio

MORE DATA? Circle 72, inside back cover



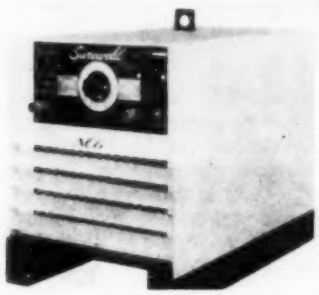
16-in. High Production Lathe Has Speeds from 40 to 2000 rpm

The Gallic (Belgian) lathe has four speeds operated by a single lever in conjunction with a clutch operated

floor pedal. Sixteen spindle speeds range from 40 to 2000 rpm with an alternate range of 28 to 1400. Unit has 42 longitudinal and 42 cross-feeds with threading range of 54 tpi from 96 to 1⅝. A 16 x 40 and a 16 x-60-in. model is available.

Distributed by Index Industrial Corp, 660 Madison Ave, New York 21, NY

MORE DATA? Circle 73, inside back cover



Welding Units Built to Withstand Rough Handling, Adverse Weather

Sureweld DRH Series of horizontal dc rectifier welders designed for use by ship builders, contractors, and metal fabricators are completely weather-proofed against rain, cold, heat, and salt spray.

Performance features include dual current range with single rheostat controlling output in each range; max arc stability because of a weld stabilizer, specially designed transformer and high open-circuit voltage; simple hand or foot low-voltage remote control units; horizontal cabinet construction to simplify stacking of units. Model DRH-222A (200 amp) has welding ranges of 25-225 and 30-300 amps; DRH-333A (300 amp) 40-295 and 75-450 amps; DRH-444A (400 amp) 50-350 and 100-600 amps.

National Cylinder Gas Division of Chemetron Corp, 840 N Michigan Ave, Chicago 11, Ill

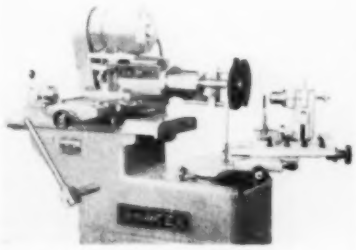
MORE DATA? Circle 74, inside back cover

Carbide Boring Tools Offered For 1/16 to 1-in.-dia Bores

Line is specifically designed for the needs of high surface speed jig boring in small bores. Tools may be furnished in sets which include We-Bor adjustable holders, or they can be furnished separately for use with any standard boring tool holder.

Wetmore Tool & Engrg Co, 5320 E Washington Blvd, Los Angeles 22, Calif

MORE DATA? Circle 75, inside back cover



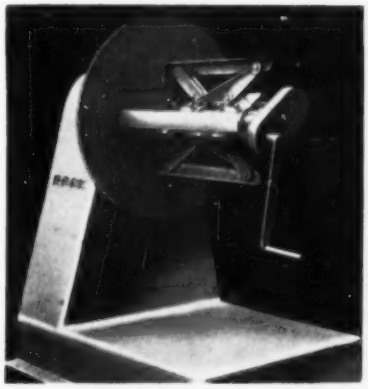
Union Twist Drill Introduces Tangent-Arc Profile Grinder

Hartex (German) No. 3 is designed for sharpening cutting tools having radii in cutting surfaces and for grinding clearances on profile straight or angular cutters. Incorporating a reciprocating horizontal wheelhead and a revolving workhead, unit can accommodate arbor type cutters up to 10 in. in dia and taper shank mills up to 12 in. overall length.

Two cross-slides on the wheelhead and three slides on the workhead provide complete adjustment. Wheelhead reciprocates on precision ball slides. Workhead revolves on preloaded taper roller bearings and is provided with adjustable stops.

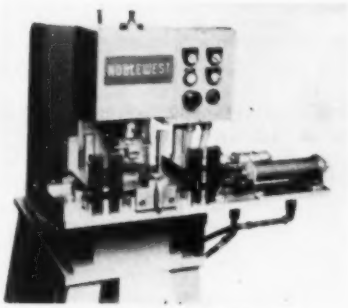
Union Twist Drill Co, Hartex Div, Athol, Mass

MORE DATA? Circle 76, inside back cover



DECOILERS handle coils of steel and other materials weighing up to 10,000 lbs and in widths to 30 in. Most models are electrically powered—*Elkhart Welding and Boiler Works, Inc, 2132 S Main St, Elkhart, Ind*

MORE DATA? Circle 77, inside back cover



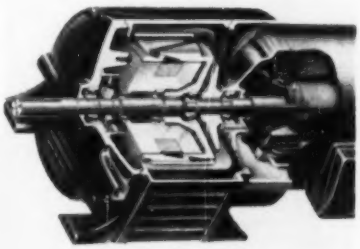
Serial Numbering Machine Numbers 4500 Pieces per Hour

Serial numbering press, which is air operated, electrically controlled and automatic, can number 4500 pieces per hour. Features include fully adjustable machine speed, and ram pressure and interchangeability of magazines from one plate size to another.

Model 531 is shown tooled for consecutively numbering name plates. A small air cylinder indexes the numbering head. Name plates are loaded into a magazine at the right, fed one at a time into marking position, and then fed into an unloading magazine by an air cylinder which operates in sequence with the press ram.

Noble & Westbrook Mfg Co, Westbrook St, East Hartford, Conn

MORE DATA? Circle 78, inside back cover



GE Adjustable Speed Drives Use Eddy Current Couplings

Lowcost line of eddy current coupling adjustable speed drives from 5 to 100 hp features simplified design with fewer moving parts.

In an eddy-current coupling, the output shaft speed is varied by controlling the excitation on the coupling field coil. Output torque is approximately equal to input torque at all times.

The drive, tradenamed Kinatrol, is offered as a pre-wired package which includes the drive unit, control enclosure for the coupling and integrally mounted Tri-Clad 55 ac

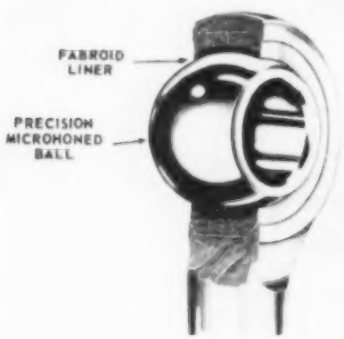
motor, and operator's station.

Ratings through 20 hp are capable of continuous operation down to 100 rpm at rated torque providing a 17:1 speed range. Regulation of 2% of full speed can be obtained with standard equipment.

Coupling field coil and tachometer generator are stationary, with no brushes or slip rings. Windings are epoxy encapsulated.

General Electric Company, Direct Current Motor and Generator Dept, Erie, Penna

MORE DATA? Circle 79, inside back cover



Self-Lubricating Bearings Made Of Teflon, Glass Cloth, Phenolic

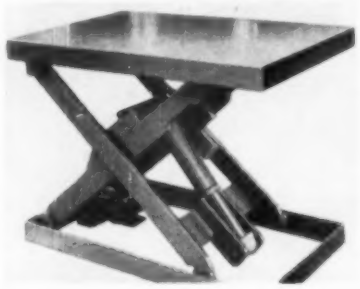
Self-lubricating bearings for high unit load, low velocity applications use Fabroid as the lubricating element.

Fabroid is a fabric woven with both glass fibers and Teflon fibers and backed up by a second fabric of glass cloth impregnated with phenolic. The lattice of glass fibers prevents the Teflon from cold flowing. The phenolic prevents movement of the glass fibers and assists in bonding the whole metal shell.

Fabroid is used in self-aligning bearings and rod ends and in journal bearings.

Micromatic Hone Corp, 8100 Schoolcraft, Detroit 3, Mich

MORE DATA? Circle 80, inside back cover



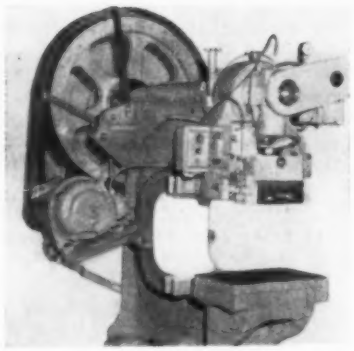
Porta-Lift Production Lifts Are Self-Contained Units

Porta-Lift is available in a wide range of sizes and lifting capacities for a variety of applications such as feeding, receiving, leveling, positioning for conveyors, stamping machines, presses.

Unit can be lowered to inches above floor level when not in use; flip-up top permits accessibility from any angle for servicing; automatic control can be set to raise, lower, and stop at any height desired.

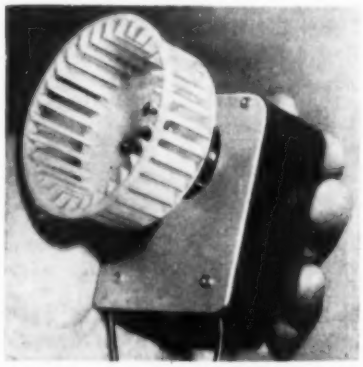
Autoquip Corp, 1140 S Washtenaw, Chicago 12, Ill

MORE DATA? Circle 81, inside back cover



30-TON PRESS with 24-in. throat is addition to Perkins deep-throat press line. Machine has new pitman and ram construction which has a cross-bar knockout. It is also equipped with air cylinder tripping — *Perkins Machine Co, Warren, Mass*

MORE DATA? Circle 83, inside back cover



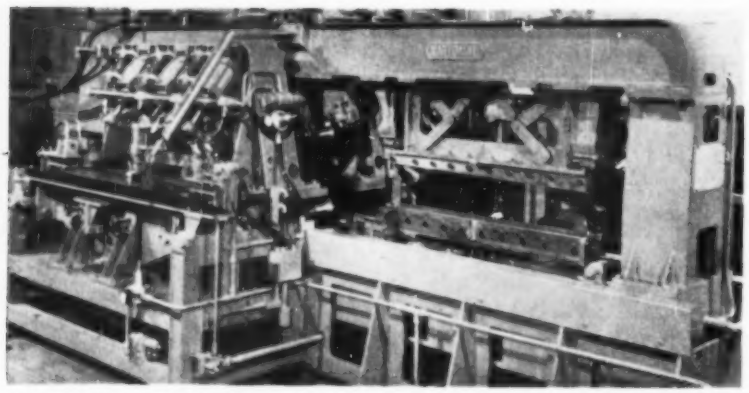
Unit Bearing Electric Motor Has Sealed-In Lubrication

Howard S/L-1085 is a fractional horsepower unit made to run continuously for years without attention. Lubricating oil is sealed inside the turning-rotor, cutting down oil oxidation to a minimum. Company guarantees the motor to run for five years without oiling.

Characteristics include two-pole winding—it can be wound for 110 or 220 50/60 c voltage. Unit-bearing rotor turns on a stationary shaft at 3400 rpm without a load, 2600 to 3200 rpm with recommended loads; hp ratings are 1/750 to 1/85. It is built to operate in range of temperatures from −10 to +250 F, and is available as a skeleton motor or in a housing with variety of mounting plates. Model can be fitted with circulating blowers 2 to 3 in. in dia, 4 to 6-in. plastic fans, or with gear boxes.

Howard Industries Inc, 1760 State St, Racine, Wis

MORE DATA? Circle 84, inside back cover



AUTOMATED STRIP WELDER that uses mash seam welding to eliminate joint separation joins normal strip mill sheets. It can operate on both tin plate recoil and inspection lines and annealing and galvanizing lines. Welding speed is 30 fpm in a 30-second cycle; current is provided by a 150-kva welding transformer. Upper welding roll meets the work under 2200 lb of weld force from a 6-in. air cylinder operating at pressure of 80 psi. Unit has built-in automatic system for welding roll dressing—*National Electric Welding Machines Co, 1846 Trumbull, Bay City, Mich*

MORE DATA? Circle 82, inside back cover

56

S&F GEAR TESTERS CAN'T BE WRONG!

AND THEY NEVER ARE— AT ECLIPSE-PIONEER

Division of Bendix Aviation Corp., Teterboro, N. J.

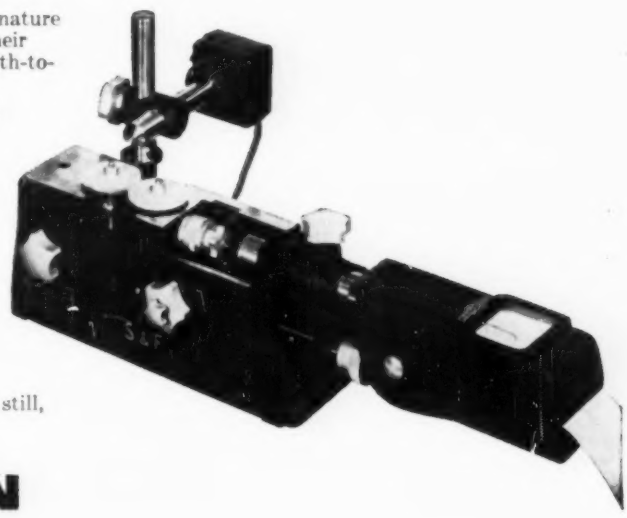
Turning out Precision Class 3 Gears is almost second nature to Eclipse-Pioneer. These are the gears that go into their famous directional gyros for aircraft and missiles. Tooth-to-tooth error, .0002". Total composite error, .0003".

The first S & F Tester bought by Eclipse-Pioneer four years ago told them what they wanted: no other gear checker was so accurate, so easy to use.

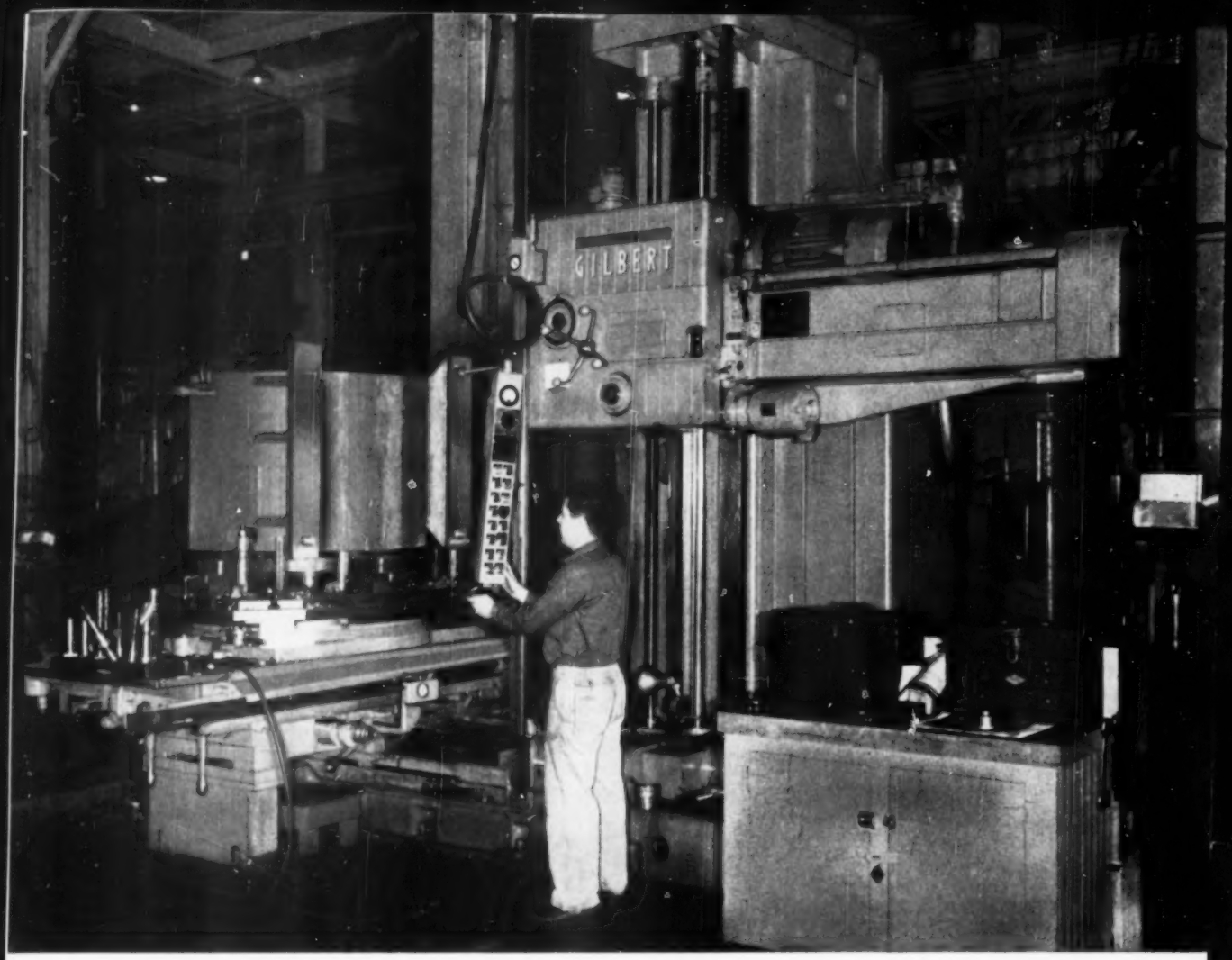
So they kept buying them. For floor after floor. Section after section. Year after year. Now, 56 S & F Testers act as guardians of precision all over the plant—assurance that Eclipse-Pioneer gears really hold to the tolerances called for.

Would *you* like to be assured that the gears you make—or buy—are as accurate as they're supposed to be? Check them on an S & F—guaranteed to repeat within .00001"—as 359 plants now do.

Ask us to send you the name of a nearby user. Better still, may we demonstrate the S & F for you?



KURT ORBAN COMPANY, INC.
36 Exchange Place, Jersey City 2, N. J.



Courtesy The Reliance Electric and Engineering Co.

5″ Gilbert cuts setup time 20%, operating time 20% for Reliance

"This 5" Gilbert is saving us approximately 20% on setup and 20% on operating time on motor frames," reports W. R. Henninge, Methods Engineer at The Reliance Electric and Engineering Co., Cleveland.

But those are only part of the savings earned by this versatile machine. On some close tolerance jobs, such as rockers, Reliance either had to make jigs costing $500 and more, or send each part to their tool room to be run on a jig borer.

Now, by making a very simple locating fixture, and using the Gilbert's automatic positioning, they have cut the job in half. At the same time, they have eliminated scrap and improved accuracy for assembling.

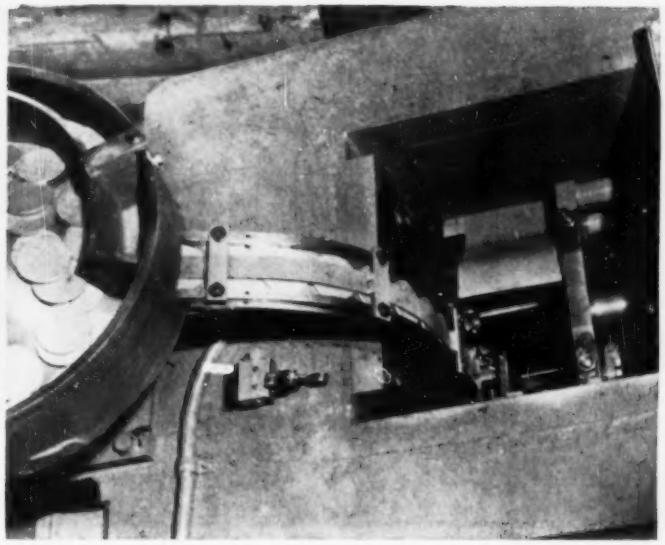
Wouldn't savings like that be important to your company? Your nearby Cincinnati Gilbert representative can show you how to get them.

The Cincinnati Gilbert Machine Tool Co., 3340 Beekman St., Cincinnati 23, Ohio

Ask for new catalog

GILBERT

FIELD REPORT...



120 aluminum beer cans a minute . . .

. . . is the output of the Bliss impact extrusion press soon to be installed in a Golden, Colo, brewery. The new press, developed by Bliss for Aluminum International Inc, impact extrudes aluminum cans at twice the speed of fastest machine previously available, according to Bliss officials. Demonstrating the press at its preview in Canton, Ohio, are from left: A S Burgoyne, Bliss vice president manufacturing, and B E Myer, sales manager of Bliss's Container Machinery Division, as Jack Porterfield, chief engineer of Aluminum International looks on. Photo at right shows die area of the new press. Automatic hopper feed (left) delivers ⅛-in.-thick aluminum blanks to the female die, then impact extrudes the blank into a standard 12-oz beer can

Lamb to Double Machine Assembly Area

F Jos Lamb Co, Detroit machine tool builder, is scheduling a new addition to its plant that will more than double machine assembly area and add more than 25% fabricating space. New structure is designed to handle assembly of large special and transfer type machines. It'll be 6 ft higher than existing highbay area and will be equipped with two 10-ton overhead cranes plus a 72-foot shipping well at the rear.

$100 Million Mace Order to Martin

Defense Department has authorized the Air Force to go ahead with procurement of the Mace missile, probably about 100 of them. Martin Co is the prime contractor. It's expected that as rapidly as the Mace is delivered, the forces already trained in its use will take it to Europe and the Far East, replacing one by one the Matador units now there.

National Forge Buys German Vacuum Treatment Unit

Advanced type of vacuum treatment unit reported to be capable of producing substantial improvement in the quality of steel forgings has been bought by the National Forge Co of Irvine, Penna, from the Lectromelt Furnace Division of McGraw Edison Co. The 10 to 60 ton unit will be installed in the melting department during the first half of 1960. Equipment was developed by Dortmund-Horder Huttenunion, Germany's largest steel producer. National Forge will be the first company in the US to use the system in the production of steel forgings. Crucible Steel has purchased a D-H unit to treat rolling steel; it processes in the 40 to 200 ton range.

American Brake Shoe Buys Automation Components Maker

Raymond Atchley Inc, California manufacturer of electro-hydraulic and electro-pneumatic servocontrols for aircraft and missiles and for use in automated production machinery, has been acquired by American Brake Shoe Co, New York, through an exchange of stock; it will be operated as a wholly owned subsidiary. A major product line of Brake Shoe is industrial hydraulics, particularly pumps, presses, valves, and controls used in production machinery and automated equipment. Atchley products will complement this line, and give Brake Shoe expanded capabilities in the field of automation.

GE Upping Louisville Hiring

Employment at General Electric's Appliance Park, Louisville, Ky, is taking a 700 to 800 jump this month. New jobs put total employment at the Park near the 12,000 mark, highest level since June of 1957. Most of the jobs are in the assembly and fabrication areas. The household refrigerator department is absorbing the bulk of the employment increase, but every department at the Park is adding some people.

Collins Machinery Expanding

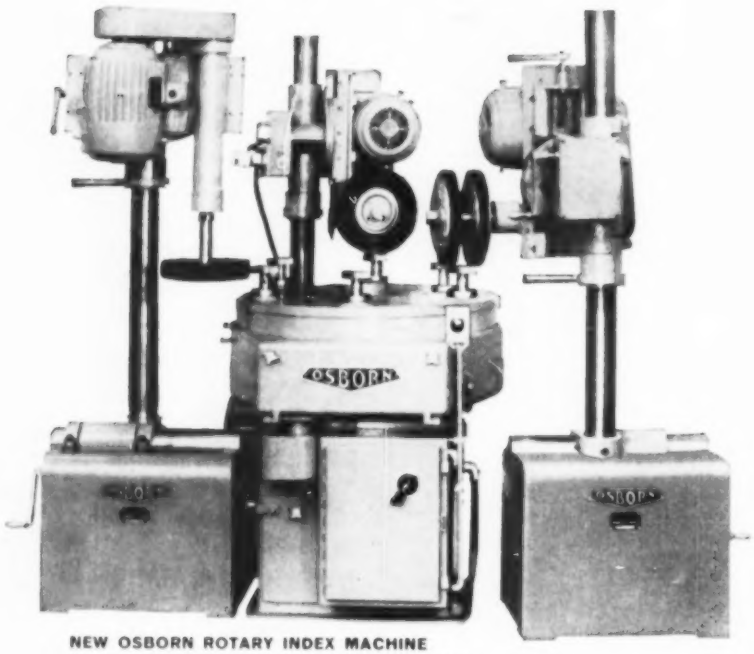
Collins Machinery Corp, Los Angeles manufacturer of precision cutting and threading machines, will put up a new 30,000 sq-ft structure in Monterey Industrial Park, Calif. Opening is scheduled for early March.

Hughes Aircraft in the Heather

Hughes Aircraft's first European plant will be established at Glenrothes, Fife, Scotland. The $280,000 facility to be built by the Glenrothes Development Corp will be turning out semi-conductor devices and allied electronic components by Sept 1961. As plant reaches its capacity by end of 1962 more than 300 will be on the payroll, increasing later to 500 after planned expansions.

To cut your metal finishing costs . . .

NEW—
OSBORN
ROTARY
INDEX MACHINE



NEW OSBORN ROTARY INDEX MACHINE
Units can range from manual to fully automatic operation

Unique "building block" design means unlimited production flexibility

NEWEST ADDITION to Osborn's broad line of metal finishing machines are these Rotary Index units. Capability: significant increase of your production capacity.

Most important feature—production men can economically "build" *custom* metal finishing machines from *basic "building block"* components . . . finishing heads, index tables and electric controls. Other advanced design and construction features make these new Osborn Metal Finishing Machine units worth your immediate investigation.

Your Osborn field specialist has latest application data on a wide range of cost-saving finishing methods. And an Osborn Analysis—made in your plant—is the first step to pinpoint savings on *your* operations. Write for details. *The Osborn Manufacturing Company, Dept. C-93, Cleveland 14, Ohio.*

THE OSBORN MANUFACTURING COMPANY

METAL FINISHING MACHINES . . . AND FINISHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES
FOUNDRY PRODUCTION MACHINERY

OSBORN

Field Report . . .

France Crushing Old Autos

New press weighing 300,000 lb will be shipped to Paris soon by the D & J Press Co, North Tonawanda, NY. It can swallow a whole car, including the motor, and bale it to the size of a filing cabinet. An order for an additional ten presses is expected by the firm, for France has decreed that all autos over 20 years old must be taken off the highways. This will mean about a million cars.

Fried Steel Licenses British Firm

Fried Steel Equipment Manufacturing Corp, New York, has concluded an agreement with Weldall & Assembly Ltd of Stourbridge, England, one of the largest steel fabricators and conveyors specialists in Great Britain. Licensing arrangement has been reached whereby the British company will manufacture and sell Fried units on a worldwide basis, with the exception of the Americas and Canada. Fried products include the Liftveyor, Stripveyor, and Strip-Stacker for sheet and plate squaring shears, and the recently developed automatic, electronically controlled Sheet Assorter.

Copperweld Expanding in Ohio

Copperweld Steel Co is starting a $5.3 million expansion of facilities at its Warren, Ohio, plant. Project is part of a $15.8 million company-wide expansion planned for its five divisions, largest of which is the Warren facility. Build-up there will include addition of four more soaking pits, an increase in annealing and heat treatment furnaces, and a new electrode furnace. Facility now employs 2900 and expects to up this figure as expansion progresses.

Southern Coach & Body Co . . .

. . . Evergreen, Ala, has a contract from an undisclosed Michigan truck manufacturer for 3000 half-ton integral truck units. This marks the first time an integral parcel-delivery truck will be built in the South. As a result of the order, Southern Coach is launching a $300,000 plant expansion program that'll provide five times the productive capacity of its present facilities.

Philco Gets $6.6 Million AF Job

New $6.6 million order has been received by Philco's Government and Industrial Division in Philadelphia for the second phase of the Air Force's program to bring its

worldwide communications system up to date. First contract, worth $18.7 million, was awarded to the division in April. Philco will furnish and install new equipment and handle the engineering work.

Beckman Instruments Buys Two

Beckman Instruments Inc, Fullerton, Calif, has acquired Harold Kruger Instruments, San Gabriel, Calif, and Tool-Lab Inc, Escondido, Calif. Kruger products include chemical analysis equipment, air pollution monitoring instruments, portable mercury vapor detectors, precision metering pumps, and Teflon connectors. Tool-Lab makes precision electric meters.

Altamil Expands Tenn Operation

Altamil Corp has put into operation a $100,000 addition to its Tullahoma plant for chemical milling of stainless steel parts for the B-70 and F-108 airplanes. Addition includes a 5760 sq-ft building, a water scrubber for air filtering, and a 3-transformer power substation.

Lukens' Giant Plate Mill

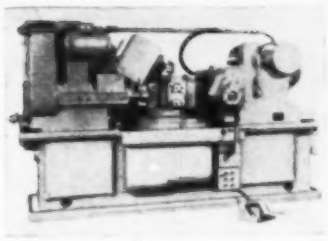
Lukens Steel Co has put into operation a 140-in. plate mill, marking the completion of a two-year, $33 million expansion program. The automated mill can squeeze a 60,000-lb 30-in. ingot of steel into a 10-in. slab in less than two minutes. It's powered by a 10,000-hp electric system designed by General Electric Company.

Duff-Norton in NC

Duff-Norton Co, Pittsburgh, is moving its jack and hoist manufacturing operations to Charlotte, NC. It'll lease a $1 million plant now under

"I don't know what I'd do without you, Miller, but I'd rather."

Here's what is meant by **"1·2·3"** in the **GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINING**



The outstanding advantage of this machine is ability to handle operations on one, two or three ends of a piece *simultaneously or in sequence, without changing set-up or rehandling*. It is the only standard machine that will do this.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence—a method exclusive with Goss & DeLeeuw and offered on this machine.

For complete details ask for illustrated bulletin. Send samples of your work for time and cost estimates.

GOSS and DE LEEUW MACHINE COMPANY. KENSINGTON. CONN.. U.S.A.

GOSS & DeLEEUW QUALITY PRODUCT-QUANTITY

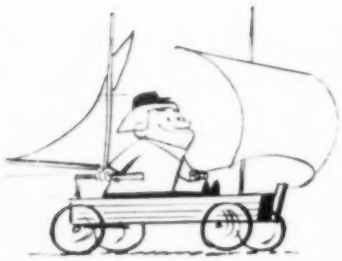
COOLANTS
WORK
FASTER,
BETTER,
LONGER,
with
RUTHMAN
GUSHER
COOLANT PUMPS
Yes, you get split second coolant flow from the moment the machine is turned on. And Gusher Pumps are designed better for more efficient operation. They need no maintenance, no priming or packing. Ball
Best of all they are
LOWER IN INITIAL COST, TOO!
Write for catalog
THE Ruthman
MACHINERY CO.
1819 Reading Road, Cincinnati, Ohio
Coolant Pumps Circulators

CIRCLE 219 READER SERVICE CARD

construction and scheduled for completion next June. New facility will employ about 300.

MEMOS

by BESS RITTER



According to some ingenious mechanical inventors, there was no reason why sails should be restricted to water vehicles only, and they proved their point with what we can only term "sail cars" for convenience:

One, which was put into operation in Holland in 1600, looked exactly like a sail boat except for the fact that it had a pair of wheels at either end. It was equipped with two large sails, and its similarity to a water vehicle was complete all the way down to a spy glass and a steering rudder. It carried twenty-eight passengers, and made a 42 mile journey along the Dutch coast at a speed of approximately 21 miles an hour.

Then there's the "wind carriage" of a Bishop Wilkins, who describes it in a book he wrote in 1648. A windmill was set up in the front of a conventional wagon, and the idea was for the wind, via the windmill, to propel the carriage forward. We have no record of how successful this was, but Wilkins' arguments make good sense: "Experiments of this kind," he states, "are very pleasant, and not costly," because "what could be more delightful . . . than to make use of the wind (which costs and eats nothing) instead of horses?"

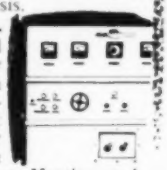
The next try at land sail power apparently wasn't made until 1827. This time the place was England, and the actual method consisted of using kites in tandem. They were attached to the vehicle by a long rope, and a car, so equipped, made a successful journey from Bristol to London. It went along at the average speed of 20 miles per hour.

MARIAN A. STACHOWIAK, Hayes Induction Heating Engineer, reports . . .

SELECTIVE HEAT TREATING CAN BE SIMPLE . . .

when equipment and application know-how go to work

High-Frequency Induction Heating . . . standard procedure for selective hardening, melting, annealing, brazing, preheating, hot forming, sintering, and vacuum heating . . . now takes a big step forward with another Hayes development — a new high-frequency induction unit that puts selective heating on a *simple* and *economical* basis.



PUSH-BUTTON Controls are featured with this new Hayes induction heater to obtain instant and exact heat distribution at any desired surface area of a steel part. Heating and quenching cycles are *automatically controlled* and are so rapid that distortion, decarburization, and excessive oxidation are practically eliminated. Protective atmosphere systems (pioneered by Hayes) can be supplied as an integral part of the induction unit.

UNIT Design Saves Space — because heater stations and power generator are incorporated in *one* compact cubicle . . . for more output per sq. ft. of floor space. Moreover, the Hayes unit includes work handling devices which can be set up simply, integrated into your production line, and operated as easily as any other machine tool.

Safe, Easy Maintenance is another feature of Hayes' design. Easy-access panels provide plenty of working room for maintenance and adjustment of components. Safety interlock switches throughout shut off plate power when panels are opened. Write for information on Hayes new induction heating unit, work tables and accessories . . . or other "Results Guaranteed" furnaces in Hayes Certain Curtain line.

FREE BULLETIN 5910

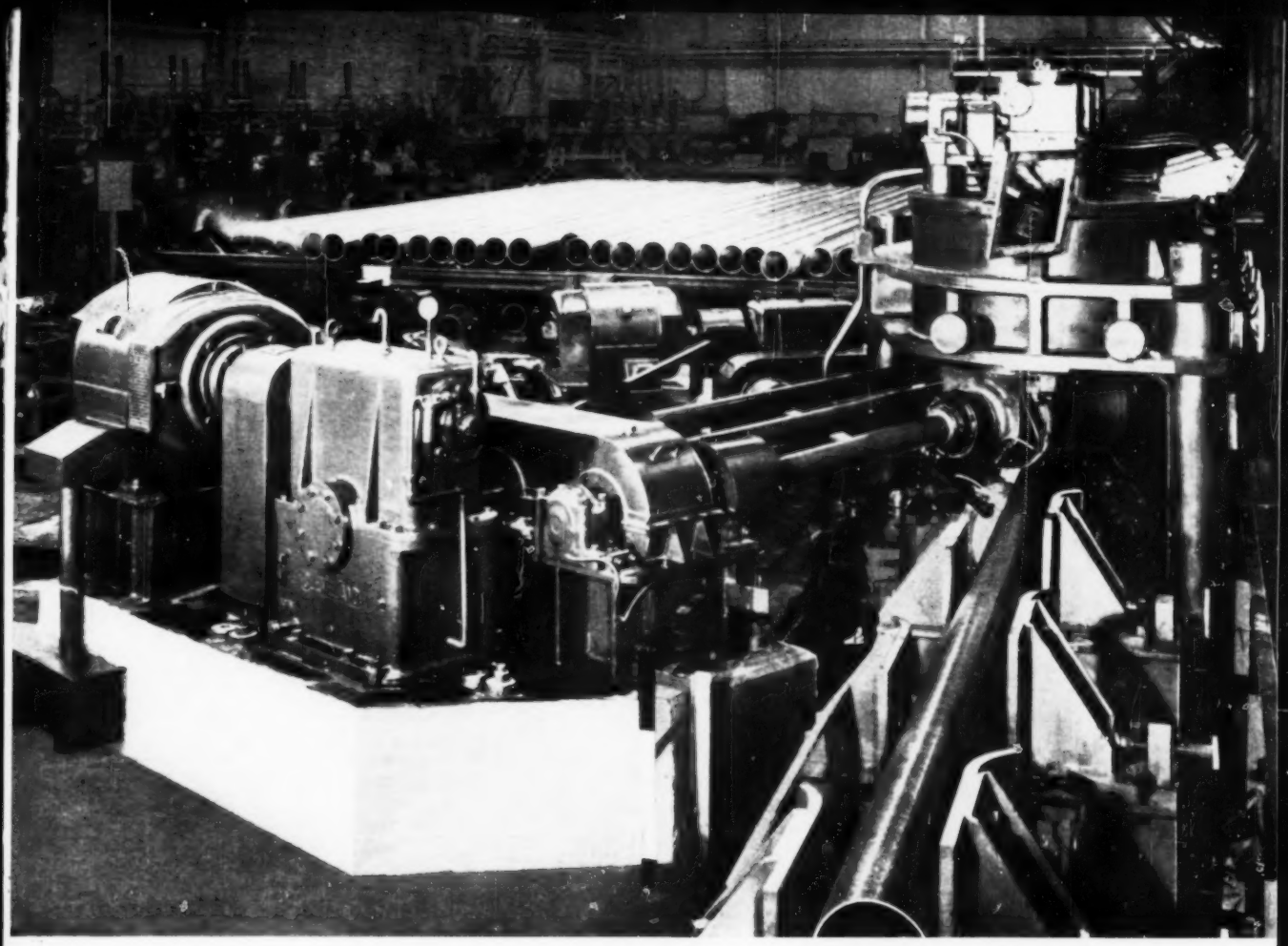
C. I. HAYES, INC.

837 Wellington Avenue • Cranston 10, R. I.
Established 1905

It Pays To See Hayes for metallurgical guidance, lab. facilities, furnaces, atmos. generators, gas and liquid dryers.

CIRCLE 220 READER SERVICE CARD

CIRCLE 221 READER SERVICE CARD ►



How to straighten the really big pipe!

One major Eastern steel producer has found the answer – the big Mack-Hemp Model A-5 Straightener shown above – the largest of its type in the world!

This A-5 takes really big bowed pipe from the sizing mill, pulls it in through three pairs of opposed cross rolls and then spins it out straight and round to high tolerances in only a single pass.

This despite the fact that the steel pipe being straightened is 16-inch in diameter, fifty feet in length!

To do a job like this, of course, the massive 85-ton roll frame is a must, as are the heavy duty rolls, and the combined 200 HP motors used to drive all six of them. In its first year, this Mack-Hemp A-5 straightener has handled more than 200,000 tons of pipe.

If straightening pipe or tubing is your problem – any size, any alloy – consider doing it yourself. The men from Mack-Hemp will be glad to give you all the facts you'll want to know.

MACKINTOSH-HEMPHILL
Division of E. W. BLISS Company
Pittsburgh and Midland, Pa.

the STRIPPIT FABRICATOR

WORK PIECE – Electronic Chassis — 10" x 14" — 23 holes — 5 sizes — 4 different shapes — 4 corner notches

SETUP TIME – 9.3 minutes

PRODUCTION RUN – 5 pieces

PRODUCTION TIME PER PIECE – 2.8 minutes

For short or pilot runs—model shop and experimental work—no other single machine can match the production capabilities and profit potential of the Strippit Fabricator.

PUNCHES—any round or shaped hole up to 3½" diameter in sheet material — up to ¼" mild steel.

NOTCHES—90° corners — rectangular, radii, vee and special shape edge notches — up to ⅛" capacity in mild steel.

NIBBLES—straight line or contour shearing up to a 38" diameter circle, at 165 strokes per minute, ⅛" mild steel.

ACCURATE, QUICK-SET GAUGING—a unique, multiple-stop system permits exact positioning of the work to any layout specifications in seconds instead of minutes.

QUICK-CHANGE PUNCHES AND DIES—changed from one size to another in less than 20 seconds — within easy reach in labeled, built-in file drawers.

EASY CONVERSION—to a production punching unit by adding the Strippit Duplicator for high speed production of hundreds of pieces — and the Dupl-O-Scope to punch Duplicator templates from a drawing, layout or sample part.

WRITE TODAY—for Catalog 10 AA and an actual demonstration right at your own plant of the capabilities of this high-profit fabrication system, by a Strippit Mobile Demonstration Unit.

WALES STRIPPIT INC.
200 Buell Road • Akron, New York

HOUDAILLE INDUSTRIES INC.

In Canada: Strippit Tool & Machine Company, Brampton, Ontario

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 MACHINE TOOLS—*Heald Machine Co, 12 New Bond St, Worcester 6, Mass.* 16-page illustrated condensed general catalog 1-2 describes basic design features of all Heald machines; covers various models of Bore-Matics, internal grinders, rotary surface grinders, tool sharpeners, boringheads, wheelheads, and attachments available.

2 AIR HYDRAULIC DRILL UNIT —*Hartford Special Machinery Co, 287 Homestead Ave, Hartford 12, Conn.* 6-page bulletin contains illustrated information on new Model 17-400 designed as a building block component for assembly into automatic machines custom engineered to meet specific production requirements. Covers construction, design details, advantages; includes full specifications and dimensions.

3 HIGH-SPEED POWER PRESSES —*Cleveland Punch & Shear Works Co, 3917 St Clair Ave, Cleveland 14, Ohio.* 4-page folder HS-1 gives data on line of 11 different types. Includes press production chart to aid in determining how these units can increase production and efficiency.

4 DRILL POINTER—*Winslow Product Engineering Corp, 47 St Joseph St, Arcadia, Calif.* 4-page illustrated bulletin describes Model 100 Winslo-Matic that produces helical, split-point, or conventional points automatically, concentric within 0.0002 at speeds up to 1200 drills per hr. Operational details, features, specifications included.

5 AUTOMATIC THREAD GRINDER —*Jones & Lamson Machine Co, Clinton St, Springfield, Vt.* Data sheet illustrates and describes features and advantages of Model F for high production of standard taps. Machine capacity is ¾ in. dia, 5¾ in. length; max swing over table, 10 in. dia; max thread length, 3 in. Ten standard work speeds range from 30 to 360 rpm.

6 MACHINE TOOLS — *Taft-Peirce Manufacturing Co, Woonsocket, RI.* 8-page net price list 217 contains brief descriptions and specifications of surface grinders and accessory equipment for them; back spot facing machines; 24-in.

"The board of directors estimates that your suggestion will save the company over $85,000 a year and they have therefore empowered me to ask what kind of cigars you smoke."

Bodine

CASE HISTORY No. 49

showing what ONE versatile Bodine is doing for MANNING, MAXWELL & MOORE, Inc.

PARTS:
One is brass, the other tough AISI 347 Stainless Steel.

OPERATIONS:
Drill, chamfer and tap (#8-32) two holes 5/16" deep.

PRODUCTION:
Brass, 800/50 min. hour, Stainless, 175/50 min. hour.

PARTS:
Brass.

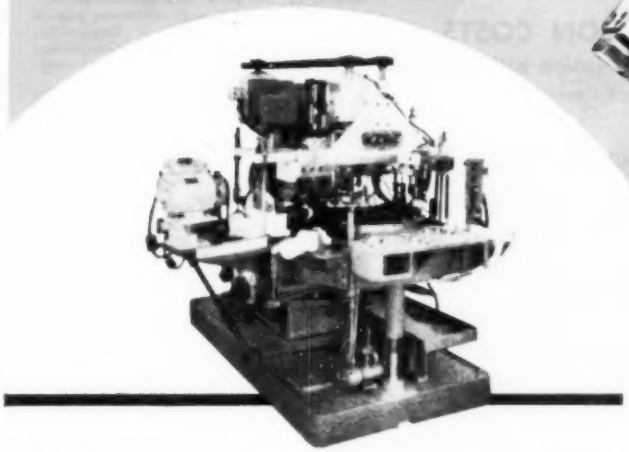
OPERATIONS:
Drill and countersink two holes, .173" dia. with .350", 82° countersink. Also drill and tap (#2-56) two holes.

PRODUCTION:
1500/50 min. hour.

PARTS:
Forged brass gauge-sockets.

OPERATIONS:
An unusual feature is two-step drilling of two holes . . . first 1/2-way through, using #37 (.104") half-round drills with bushings; then drill through and chamfer in one operation, using combination half-round drills. By this method tolerances on hole centers are held to ± .001" on the entry and ± .003" on exit side after drilling through 9/16" of stock. Tap same two holes #6-32 9/32" deep. Mill slot .135" (± .002") wide x .156" deep with horizontal milling spindle and 4" saw-type cutter. Drill hole from bottom of milled slot #44 (.086), 5/16" deep.

PRODUCTION:
Position and clamp; auto unclamp and auto eject; 1250 pieces per 50 min. hour.



PART:
Stainless Steel (AISI 347).

OPERATIONS:
Drill, chamfer and tap (#2-56) two holes 3/16" deep.

PRODUCTION:
150/50 min. hour.

All these parts and operations on ONE machine with only TWO dial changes!

Here is a good example of Bodine versatility . . . and especially of the ability of a single Bodine Basic Machine to handle exacting jobs of widely differing shapes, sizes, materials and operations . . . with changeover reckoned in minutes rather than hours.

All of these parts are processed with only two dial changes. Spindles, other accessory equipment, and tooling are also basically standardized Bodine units. Retooling for possible future part and operation changes will be relatively simple and inexpensive . . . an important Bodine feature.

Isn't this the kind of time-saving, cost-cutting production engineering you, too, are looking for? If so, do not hesitate to ask us for production analysis of your next job. Write Dept. AM-12.

THE **Bodine** CORPORATION

BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

TBD59

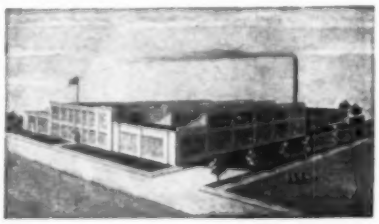
CDT can help you cut costs

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



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standard rotary lapping machine; and 24-in. semi-automatic lapping machine.

TOOLS AND ACCESSORIES

7 MACHINE SHOP ACCESSORIES —*Brown & Sharpe Mfg Co, Providence 1, RI.* 48-page indexed catalog 37A illustrates and lists arbors, adapters, collets, and other accessories. Covers important features and characteristics including materials, limits, dimensions.

8 MICRO HARDNESS TESTERS — *Torsion Balance Co, Clifton, NJ.* 4-page illustrated bulletin K-59 describes Kentron instruments that apply deadweight loads from 1 to 1000 g. They are available in two sizes: Model AK has vertical capacity of 2½ in. and is used as a standard research instrument in labs; Model AK-8 has vertical capacity of 8 in. and is basically a production control instrument although it has same accuracy as Model AK. Ten basic accessories pictured and described.

9 HYDRAULIC TOOLING SYSTEM —*Newton Hydraulic Tooling Co, Auburn, Mass.* 47-page catalog 2 gives information on hydraulic clamp assemblies and their components. It is described as a complete work holding and positioning system which allows tool engineer to design multiple clamp fixtures with all clamps controlled from one central point, within the cost range of ordinary screw, cam, or other mechanical clamps, including the complete hydraulic source. Includes selection table, installation information; applications discussed and illustrated with line drawings.

10 GAGING EQUIPMENT — *Taft-Peirce Manufacturing Co, Woonsocket, RI.* 8-page bulletin offers brief survey of air-electric, and electronic gaging equipment. Covers Model D CompAIRator, the Versachek, and the CompAIRamatic that checks 26 dimensions at once.

11 SOLID CARBIDE DRILLS AND REAMERS — *M A Ford Mfg Co, 1345 Rockingham Rd, Davenport, Iowa.* Bulletin 906 contains illustrated descriptions of four series of drills and a series of reamers. Gives details on Hi-Roc drill for production work in hardened steel and Hi-Roc drills for deep hole work in dies, molds, and special applications.

12 SCREW MACHINE DATA—*Eastern Machine Screw Corp, Truman & Barclay Sts, New Haven 8, Conn.* Tabular data contained in Die Headlines (Volume V, No. 2) covers weights per foot of round, square, and hexagon bars in steel.

(continued on p121)

"Ed! You got the raise!"

PLANT IDENTIFICATION No. 858
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POSITION Methods Engineer
DEPARTMENT Production
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SIGNATURE Harold Dilway
WEBSTER & HALPERN MACHINERY INC

"There's so much new stuff breaking"

"With the new South works on two shifts and our automatic model making sales records, the boys in the shop really have us hopping. Time was when I could keep up with new equipment and methods by talking to salesmen and our own people. But things are changing so fast now and we're so rushed, I have to keep up by reading at home nights."

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While both Mr. Dilway and his company are hypothetical, they are typical of men and firms in Metalworking. American Machinist will gladly provide real buying-action verbatims from actual men in Metalworking.

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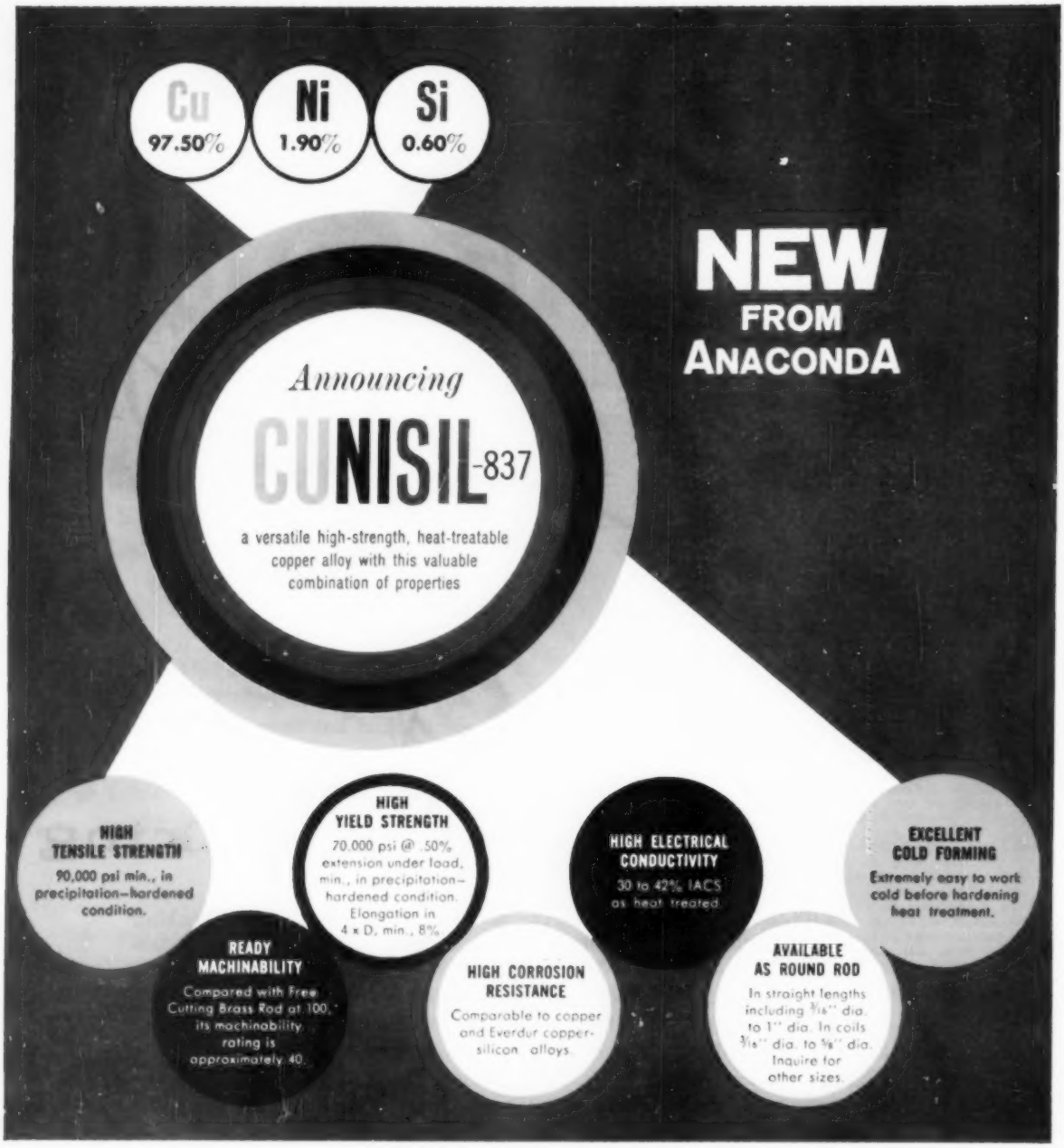
Cu
97.50%
Ni
1.90%
Si
0.60%
NEW
FROM
ANACONDA
Announcing
CUNISIL-837
a versatile high-strength, heat-treatable copper alloy with this valuable combination of properties
HIGH TENSILE STRENGTH
90,000 psi min., in precipitation–hardened condition.
HIGH YIELD STRENGTH
70,000 psi @ .50% extension under load, min., in precipitation–hardened condition. Elongation in 4 x D, min., 8%
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30 to 42% IACS as heat treated.
EXCELLENT COLD FORMING
Extremely easy to work cold before hardening heat treatment.
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Compared with Free Cutting Brass Rod at 100, its machinability rating is approximately 40.
HIGH CORROSION RESISTANCE
Comparable to copper and Everdur copper-silicon alloys.
AVAILABLE AS ROUND ROD
In straight lengths including 3/16" dia. to 1" dia. In coils 3/16" dia. to 5/8" dia. Inquire for other sizes.

METALLURGICAL COMMENT. Most of the nickel and silicon in heat-treated Cunisil are present as an intermetallic compound, nickel silicide, and it is the precipitation of nickel silicide in the form of particles of submicroscopic size by a relatively low temperature heat treatment that accounts largely for the distinctive properties of the alloy.

Prior to the hardening heat treatment, the alloy is brought to a proper condition for hardening by giving it a solution anneal at a much higher temperature and then a quenching from this temperature; at this stage the alloy is quite soft and in a condition for drastic cold-working operations. The hardening heat treatment consists of heating at a controlled temperature for a definite length of time to obtain the desired mechanical properties.

CUNISIL-837 is a high-strength, corrosion-resistant alloy that includes many of the desired qualities of Silicon Bronze or Everdur®. Its applications to date have been primarily in the electrical equipment field.

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brass, and aluminum screw stock in sizes from 1/16 to 3 in.; number of feet per thousand pieces for squares and hexagons; equivalent rpm for different surface feet from 15 to 200; chart giving pitch in decimal inches and depth of thread from 4 to 80 tpi.

13 TOOL HOLDERS—*Burgmaster Corp., 1500-01 S Figueroa St, Gardena, Calif.* 4-page bulletin illustrates and describes complete line of Tool-flex full floating holders. Three standard types include 51 individual models of general purpose, tap holder, and threaded adjustable. Tool-flex is also made as a special for such applications as large horizontal boring machines.

14 PORTABLE POWER SAWS—*Skil Corp, 5033 N Elston Ave, Chicago 30, Ill.* Illustrated brochure contains information on 16 portable units; lists specifications and features of five power saw lines including high-torque super duty saws, high-speed super duty saws, high-speed heavy-duty saws, chain saws, and the recently introduced two-speed Recipro saw.

15 GRINDING WHEEL TREATMENT —*King Graphite Products Inc, 21950 Telegraph Rd, Trenton, Mich.* 4-page brochure describes treatment that retards loading and functions as a dry coolant. Once the wheel has been impregnated by dipping in Dri-Kool, its pore surfaces throughout become coated with a parting medium. The solid lubricant prohibits chip metal from gripping the abrasive and bond surfaces. Single treatment is sufficient for life of wheel.

16 EXPLOSION-PROOF CONTROLS —*Partlow Corp, 551 Campion Rd, New Hartford, NY.* 4-page booklet discusses indicating, non-indicating, and recording controls available in wide variety of temperature ranges up to 1100 F. They are made explosion-proof by isolating the electrical circuits and switching mechanism in a die-cast aluminum case mounted directly over the instrument body; remainder of the instrument operates by strictly mechanical means.

17 PREDETERMINING COUNTERS — *Veeder-Root Inc, Hartford 2, Conn.* 4-page folder describes and illustrates several of the major types of mechanical, electromagnetic, and photoelectric counters incorporating the predetermining feature. Variety of counters are

"Operator, I've been cut off."

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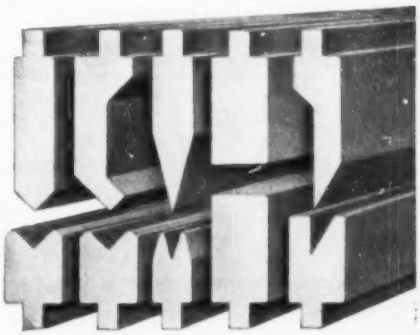

CHICAGO®
*Induction Hardened**
PRESS BRAKE DIES

This organization of local distributors offers immediate delivery on many CHICAGO *induction hardened* press brake dies. These stock dies are economical, and the quick delivery saves time in tooling. They are available in any length from 4 to 12 feet in increments of 2 feet.

Stock dies are used for a surprisingly large variety of bending operations. And, with CHICAGO *induction hardened* dies you get bonus performance and increased die life at no extra cost. Remember, these dies can be used in any make or size of standard press brake.

On your needs for press brake dies, call your nearest distributor listed here. With Bulletin D-457 you can order by number. Ask for a copy.

*Induction hardening is a special, high-frequency process used to harden the wear surfaces of CHICAGO dies. Field reports on CHICAGO *induction hardened* dies show up to ten times longer life than conventional press brake dies.

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Special Metal-Forming Machines

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SAJO No. 2 Vertical Miller

Just a glance at this rugged machine confirms its ability to perform with ease the most demanding jobs. Sajo's swivelling head, power feed to quill and unrivaled spindle construction combine versatility with unsurpassed tool room accuracy.

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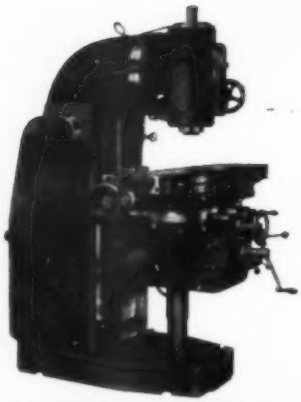

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table size: 52" x 11"
7½ and 1½ HP motors
rapid power traverse

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WITH LEITZ OPTICS

Table size —
33½" x 18½"
Spindle speeds —
63 — 2000 RPM
Boring depth — 12"
Net Weight — 7500 lbs.

MSO The ULTIMATE in

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Setting accuracy .00002".
Positioning accuracy .00012".

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Select any point as starting point. "Zero-in" scales by push button. Read scales to millionths without leaving operator's position.

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Direct reading on magnified screens in any quadrant from zero point. Table moves on double roller guides.

When only the best will do — check MSO first.

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available for handling all kinds of industrial applications in speed ranges up to several thousand counts per minute, or several thousand per second if required.

18 FREQUENCY METERS—*James G Biddle Co, 1316 Arch St, Philadelphia 7, Penna.* 20-page bulletin 32-83 illustrates and describes Frahm precision units with guaranteed permanent accuracies of ±0.1% of calibrated frequency. Meters in miniature, switchboard, and portable types are available in various ranges between 10 and 1700 cps and signal voltages from millivolts upwards. They are designed for continuous operation and are independent of wave form and exact input voltage.

PLANT SERVICE EQUIPMENT

19 GOVERNMENT SPECIFICATIONS: ADHESIVES, SEALANTS—*Magic Chemical Co, 121 Crescent St, Brockton, Mass.* 24-page catalog lists 1000 official US Government Specifications covering adhesives, sealants, paints, cleaning compounds, and chemical compounds. New edition is divided into eight sections according to Federal Class Numbers and has a complete numerical index. Specifications are listed by Government number, title and corresponding Magic Chemical Co product number.

20 HOISTS—*Harrington Co, Plymouth Meeting, Penna.* 12-page catalog R covers full line of hoist products for overhead handling of loads from ¼ through 60 tons. Covers more than 20 different kinds of cranes, hoists, and specialty and accessory items in the Peerless line.

21 STEEL BLAST CLEANING ABRASIVES—*Pangborn Corp, Hagerstown, Md.* 20-page booklet 2294 discusses important factors to be considered in selection, describes latest metallurgical developments applied in the production of steel shot. Includes list of results obtained by various companies who tested many types and brands of blast cleaning abrasives.

22 METAL CORROSION PREVENTION—*Corrosion Reaction Consultants Inc, 116 Chestnut St, Philadelphia 6, Penna.* 8-page catalog contains data on CRC 3-36, a liquid formula useful in both metal manufacturing and maintenance. Explains how it works, how it is applied, duration of effectiveness, and gives details of physical specifications. Typical applications included.

23 SPRAY PAINTING — *Ransburg Electro-Coating Corp, PO Box 23122, Indianapolis 23, Ind.* 12-page illustrated brochure presents information on principles and uses of the No. 2 Process Electrostatic Hand Gun. Applications pictured and discussed; advantages outlined.

PARTS AND MATERIALS

24 GEARBELT DRIVES — *Browning Manufacturing Co, Maysville, Ky.* 57-page catalog GB-201-A describes units that combine flexibility of belt drives with advantages of chain and gear drives. Drives are made in five pitches to handle wide range of loads, speeds, and applications. In addition to specifications on stock items of Gearbelts and Gearbelt pulleys, catalog contains design and installation suggestions, engineering data and examples, along with tables of hundreds of practical stock drive combinations already worked out for convenient selection.

25 SUPER CORROSION RESISTANT ALLOYS—*Carpenter Steel Co, Alloy Tube Division, Union, NJ.* 6-page bulletin

on tubing and pipe made of Hastelloy Alloys B and C outlines applications and describes their resistance to corrosive fluids. Tables show comparative resistance to various corrosive media at specified concentrations and temperatures. Tabular data included on chemical analysis and physical and mechanical properties as well as size ranges available, tolerances, and workability.

26 GEAR GENERATORS — *Farrel-Birmingham Co, Consolidated Machine Tool Division, 565 Blossom Rd, Rochester 10, NY.* 32-page bulletin 460 describes and illustrates complete line of Farrel-Sykes units. Includes complete specifications on all models, design and construction features, application data, and information on auxiliary equipment.

27 POCKET GUIDE TO STEEL ANALYSES—*Jones & Laughlin Corp, Stainless and Strip Division, Box 4606, Detroit 34, Mich.* 20-page booklet lists compositions of 40 stainless steels, 184 alloy steels, and 105 carbon steels. Contains Federal Specifications with corresponding SAE, AISI, and AMS numbers.

28 ELECTRIC POWER DRIVES — *Sterling Electric Motors, 5401 Telegraph Rd, Los Angeles 22, Calif.* 68-page revised catalog 258 includes over 8000 ratings. Simplified numbering system aids in selection. Includes data and prices on the new Sterlicone Multi-Shielded line of dripproof motors, plus dimensions and modifications for squirrel cage motors, gearmotors, speed reducers, right angle gearmotors, right angle variable speed drives and variable speed drives. Ratings are from ¼ to 200 hp. Variable speed drives range from 4660 rpm to 0.2 rpm in variations from 2:1 up to 10:1.

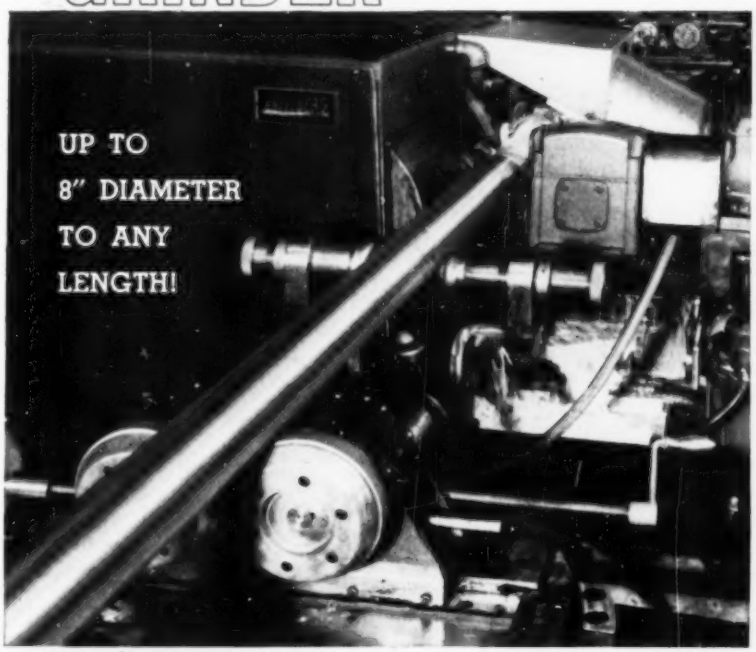
29 SUPERALLOY PERFORMANCE DATA—*Kelsey-Hayes Co, Metals Division, New Hartford, NY.* Two 8-page technical bulletins cover performance data on vacuum induction melted Waspaloy and M-252. Includes alloy description and chemical composition, physical constants, tables and charts on mechanical properties, isostress curves, and information on heat treatment and finishing.

30 CONTROL VALVES—*Ross Operating Valve Co, 120 E Golden Gate, Detroit 3, Mich.* 20-page digest catalog '59 covers all standard models with envelope dimensions, model numbers, pipe sizes, JIC symbols, and other specifications.

31 PRECIPITATION HARDENING STAINLESS STEELS—*Allegheny Ludlum Steel Corp, Oliver Bldg, Pittsburgh 22, Penna.* 24-page booklet on aircraft steels AM-350 and AM-355 gives detailed information on mechanical and physical properties at various temperatures. Includes sections on heat treating, fabrication including forming, forging, welding, brazing and machining. Both steels can be used for applications other than aircraft and missiles.

"Tell the purchasing agent that the new crane arrived and to stop by my office."

NEW HEAVY-DUTY CENTERLESS GRINDER



ENGELBERG 8132-HD

removes 3 lbs. metal per minute!

Loaded with "firsts," the Engelberg 8132-HD now makes possible exceptionally heavy single pass stock removal, extremely fine finishes, close tolerances on any rod or tube stock.

New large workpiece capacity—precision grinds and finishes any length, takes diameters from 1" to 8".

New powered outboard support system—main power unit controls synchronized "slave" units for variable through feed rates.

New automatic reverse feed—microswitch controls automatically change helix angle of outboard support power units and regulating wheel to reverse feed direction for multiple through feed passes; eliminates intermediate material handling.

New highs in production—Ex: 416 stainless steel bars 5.060" diameter, 20' length: removal .018" stock per pass at feed rate of 70" per minute. 1020 steel tubes 6¼" diameter, 10' length; removal .015" per pass at feed rate of 3' per minute.

Write for bulletin: **New Savings With Centerless Belt Grinding**

SUNDSTRAND-ENGELBERG

Precision **Abrasive Belt Grinders**

SUNDSTRAND **SUNDSTRAND MACHINE TOOL**

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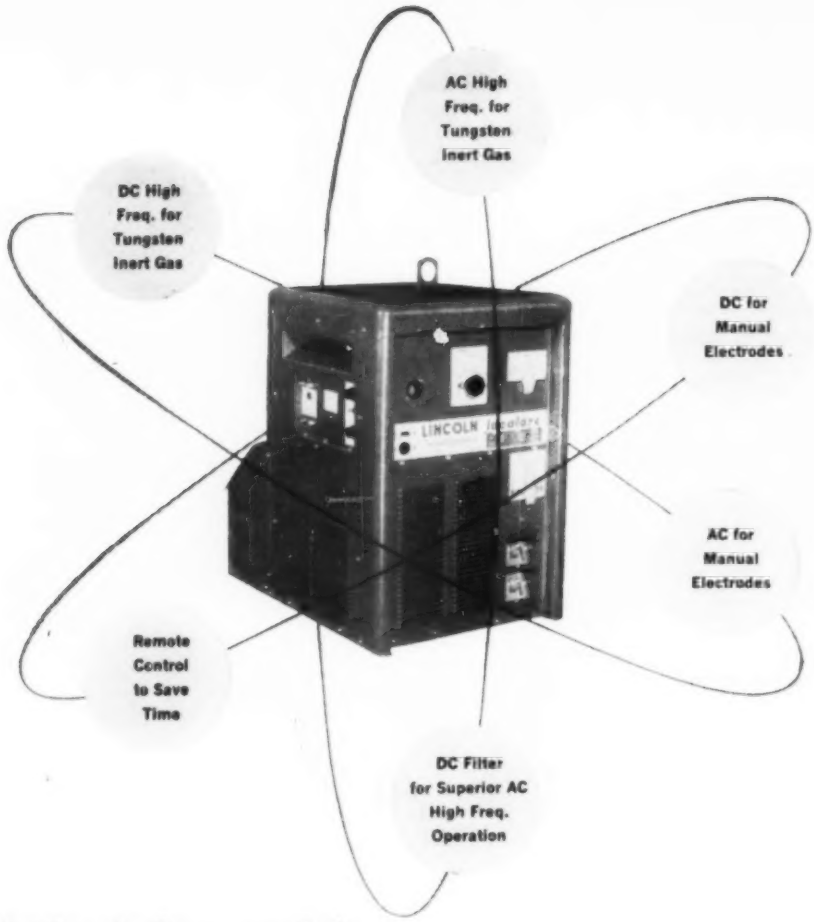
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Weld little jobs or big . . . use inert gas or stick electrode . . . on AC or DC welding current, with "IDEALARC TIG"

At last, here is a welder which gives complete versatility to maintenance-welding departments or to job shop operations. The "Idealarc TIG", equipped with high-frequency and water and gas controls can be used for welding stainless or aluminum. With just a flick of a switch, the same machine can do production welding with AC stick electrodes or pipe welding on DC.

But, if your operation does not require complete versatility, you can still have the superior welding qualities of the "Idealarc TIG" without all the optional extras. That's because Lincoln lets you select (and pay for), just the features you need.

The NEMA-rated "TIG" model has welding current ranges of 10-450 amps on AC and 10-375 amps on DC. For complete information, write to us for Bulletin 4608.1.

Price:

$1041 *(in Zone 1)*

COMPLETE WITH:

- AC and DC Current Selection
- High Frequency
- Gas and Water Controls
- Balanced Wave Filter
- Power Factor Correction
- Remote Current Control

LINCOLN ...USA

THE LINCOLN ELECTRIC COMPANY

Dept. 2041, Cleveland 17, Ohio

The world's leading manufacturer of arc welders and electrodes, ac motors and battery chargers.

Timken Roller Bearing Co, Canton, has elected **Henry A Tobey** vice president, manufacturing, Bearing and Rock Bit Division, to succeed **H M Richey** who has retired. Mr Tobey was previously general factory manager

Ford Motor Co has appointed **Peter H Ponta** director of manufacturing engineering. He was previously general manufacturing manager of the Engine and Foundry Division

Rudolph F Bannow, president of **Bridgeport Machines Inc,** Bridgeport, Conn, has been elected 1960 president of the National Association of Manufacturers. Swedish-born Mr Bannow came to the U S in 1910, went to work as an apprentice pattern-maker at the Deane Steam Pump Co, Holyoke, in 1911 at the age of 14

NAMES IN THE NEWS...

Ford Motor Co has appointed **Robert Stevenson** general manufacturing manager of the Engine and Foundry Division. **William D Innes** succeeds Mr Stevenson as chief engineer of the division's product engineering office; he was formerly an executive engineer there.

Bell & Howell, Chicago, has appointed **Robert L Chyrchel** a staff vice president with responsibility for manufacturing planning and development for all divisions and subsidiaries of the company. He was previously vice president, manufacturing. **Everett F Wagner,** assistant vice president, manufacturing, has been elected a vice president in charge of manufacturing for the photo products division.

Brown & Sharpe Mfg Co, Providence, RI, has appointed **William T Nystrom** distributor sales manager of the Hydraulics Division. He was formerly director of precision tool and gage sales for the Industrial Products Division.

Baird Machine Co, Stratford, Conn, has appointed **Donald Calkins** manager, contract services. He was formerly supervisor of the Methods Department.

General Motors Corp has appointed **Philip J Monaghan** vice president in charge of the Process Development Staff headquartered at the GM Technical Center, Warren, Mich. Mr Monaghan has been a GM vice president, and general sales manager of GMC Truck & Coach since Jan 1953. In his new assignment he succeeds **Robert M Critchfield** who has retired after 38 years of service with the corporation. **Calvin J Werner,** general manager of Moraine Products Division, Dayton, has been made general manager of GMC Truck and Coach. **Norman L Gebhart,** Moraine manufacturing manager, takes over Mr Werner's former post.

Eaton Manufacturing Co has promoted **Robert C Jacobs** from production manager to assistant general manager of the Automotive Gear Division, Richmond, Ind. **Cyril J Mann,** formerly production control manager for jet blades in Battle Creek, Mich, has been named to a similar post with Automotive Gear.

Yale & Towne Manufacturing Co has assigned responsibility for all of the company's domestic and foreign materials handling equipment operations to Vice President **John A Baldinger** (left), following the retirement of **Elmer F Twyman** as senior vice president. **Clyde R Dean** (right), sales manager of the Yale Materials Handling Division, succeeds Mr Baldinger as general manager there

Dana Corp, has elected **Louis L Melick** executive vice president. He was formerly vice president, finance, and secretary

WHY MICROHONING* of Valve Tappet Bores Assures Economical Production, Precision and Functional Surfaces

Johnson Products, Inc., (Muskegon, Michigan) is a pioneer in the manufacturing of hydraulic valve tappets. Placing strong emphasis on quality control, they demand consistent precision and geometric accuracy. Here's why Johnson engineers insist on using the Microhoning process.

Typical Johnson valve tappet — cross section shows interrupted, semi-blind-end bore.

Two of the double-spindle Hydrohoners, each spindle has its own sizing control.

Generates Clean-Cut Surfaces

Microhoning is a low-velocity abrading process that uses a combination of controlled speeds, feeds and motions to provide functional surfaces. Also, the large area of contact between abrasive and work surface spreads and easily dissipates the cutting heat. Thus, Microhoning generates clean-cut work surfaces that are free of burned or smeared metal.

Produces Longer-Wearing Surfaces

Because the Microhoned surface is cleared of amorphous material, it is in the base metal zone where longer-wear characteristics are more readily induced. Also, the unique Microhoning cross-hatch lay pattern provides a multitude of minute "plateaus" for equitable distribution of work load.

Functional Accuracy

Geometric accuracy is mandatory! For, there must be a clearance of .0002"-.0003" between tappet bore and its plunger. Microhoning consistently holds bores within the .00003" tolerance for roundness and straightness, and within .0005" for size. Proof—each tappet assembly must pass a critical "leak-down" test.

Processing Economy

In a typical production run of 31,250 parts, scrap was only three-tenths of 1%. This is a striking example of economy resulting from consistent quality processing. The use of Microhoning also eliminated previously required precision boring — several boring machines were involved in this saving.

**Registered U.S. Pat. Off.*

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

NAMES IN THE NEWS . . .

Ingersoll-Rand Co has elected **W T Alderson** vice president. Previously manager of the company's compressor engineering department, Mr Alderson will be located in the New York executive offices.

Jergens Tool Specialty Co, Cleveland, has elected **Jack H Schron** president of the firm. **Neil J Redmond** succeeds Mr Schron as vice president, manufacturing.

Robertshaw-Fulton Controls Co, Richmond, Va, has elected **Charles A Bogenrief** vice president, manufacturing. He was formerly director, facilities and tooling.

Timken Roller Bearing Co, Canton Ohio, has named **Joseph L Duzan** assistant to the general factory manager, Bearing and Rock Bit Divisions. He was previously assistant superintendent of the Canton bearing factory. **James E O'Connor**, general foreman of the Department 62 machining operations of the Gambrinus bearing factory, has been promoted to superintendent there. **Robert M Duffield**, a foreman in Department 62, succeeds Mr O'Connor.

Henry G Magnussen who has resigned as vice president and director of **Lindberg Steel Treating Co**, Chicago, after 26 years of service has been named advisor to the director, Metal Working Equipment Division, Business and Defense Services Administration, US Dept of Commerce.

Ingersoll Products Division of Borg-Warner Corp, Chicago, has elected **Blaz A Lucas Jr** vice president, sales. He moves up from the post of sales manager.

Scaife Co, Pittsburgh manufacturer of tanks and pressure vessels, missile components, and air compressors, has promoted **J Robert Pauline** to the post of vice president, manufacturing. Mr Pauline joined the company in February as vice president of the Kellogg-American Division.

Kaiser Aluminum & Chemical Corp, Oakland, Calif, has named **Thomas J Ready Jr** executive vice president. He has been serving as vice president and assistant general manager in charge of aluminum operations.

Lake Erie Machinery Corp, Buffalo, has appointed **Francis P Iapalucci** plant manager.

Precision Welder & Flexopress (Canada) Ltd has named **Albert Moore** manager of manufacturing and **William Amos** manager of engineering and sales at its new plant in Toronto. The Canadian company, affiliated with Precision Welder & Flexopress Corp of Cincinnati, will now manufacture as well as market the complete line of welding machines and high speed presses developed by the American firm.

Emerson Electric Mfg Co, St Louis, has named **Bernard Purcell** assistant vice president in charge of operations and general manufacturing manager. He was previously manufacturing manager of the St Louis Electrical Division. **Don Norton** has been appointed assistant manufacturing manager and manufacturing engineer in charge of the new Manufacturing Engineering Div.

Master Power Corp, Bedford, Ohio, subsidiary of Black & Decker Mfg Co, has named **Harry L Williamson Jr** vice president and general manager. He was formerly sales manager.

Conforming Matrix Corp, Toledo, Ohio, manufacturer of spray decorating masks, fixtures, and automatic spray finishing machines, has promoted **Leo McHue** from general manager to vice president. **Gerald D Minnick** has been appointed director of the new Semi-Conductor Equipment Division which will specialize in the development of machines for coating co-axial lead components. Mr Minnick has headed the company's product development department for the past nine years.

Royal Industries Inc, Beverly Hills, Calif, has appointed **J R Johnson** executive vice president. He was formerly senior vice president of Standard Coil Products, Chicago.

ACF Industries Inc has named **Eben C Hall** director of export sales of the American Car & Foundry Division. He was formerly associated with the Materials Handling Division of Yale & Towne Manufacturing Co where he was engaged in export sales.

Acme Industries Inc, Jackson, Mich, manufacturer of refrigeration and air conditioning systems, has promoted **Robert C Robertson** from director of sales to vice president, sales.

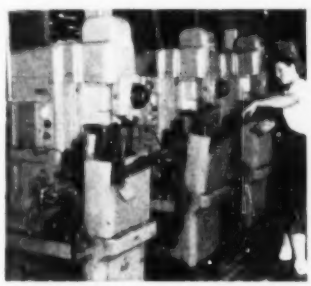
Monroe Calculating Machine Co, Orange, NJ, has named **Drummond Gaines** executive vice president. Mr Gaines was formerly vice president of Smith-Corona Marchant.

HOW MICROHONING of Valve Tappet Bores Generates Accuracy Within .00003", Eliminates Boring, Cuts Scrap Losses

To obtain functional surface qualities, engineers at Johnson Products, Inc. are insisting on Microhoning the bores of hydraulic valve tappets designed for long service or punishing usage. In addition, here is how Microhoning also generates consistently high accuracy, eliminates an extra operation and reduces scrap losses to a minimum.

Automatic, Consistent Precision

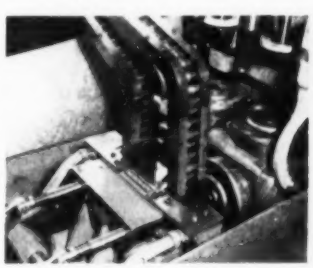
Pictured is a line of four Model 738 Microhoners that typify the Microhoning equipment used by Johnson Products. Each machine has: automatic stonefeed and stonewear compensation (Microdial); automatic sizing unit (Gage Ring Air-Switch Microsize); air operated raising and lowering of fixture table assembly is synchronized with head controls for automatic operation.



Result: Johnson automatically obtains consistent precision as evidenced by these several facts. Microhoned bores are held within .00003" tolerance for roundness and straightness, within .0005" for size, and a specified surface finish of 12-14 microinches (rms) is generated. Also, from a typical production run of 31,250 parts, only three-tenths of 1% was scrap—a striking example of processing control and low scrap loss.

Flexible and Efficient Processing

Bore diameters of Microhoned tappets range from .656" to .800", and lengths from 1" to 2". Material is either cast iron, or iron alloy hardened to 55-60 R 'C". In all, 15 different combinations of sizes and materials are Microhoned. Typical fixturing is shown to the right—it is designed to keep changeover time at a minimum.



From .004" to .005" stock is removed during the Microhoning cycle of 18 to 21 seconds. Cutting efficiency is boosted by the design of special Micromold tools. Intraflow features (within the tools) supply coolant directly to cutting zone.

We will gladly send more information on the Microhoning process and equipment—
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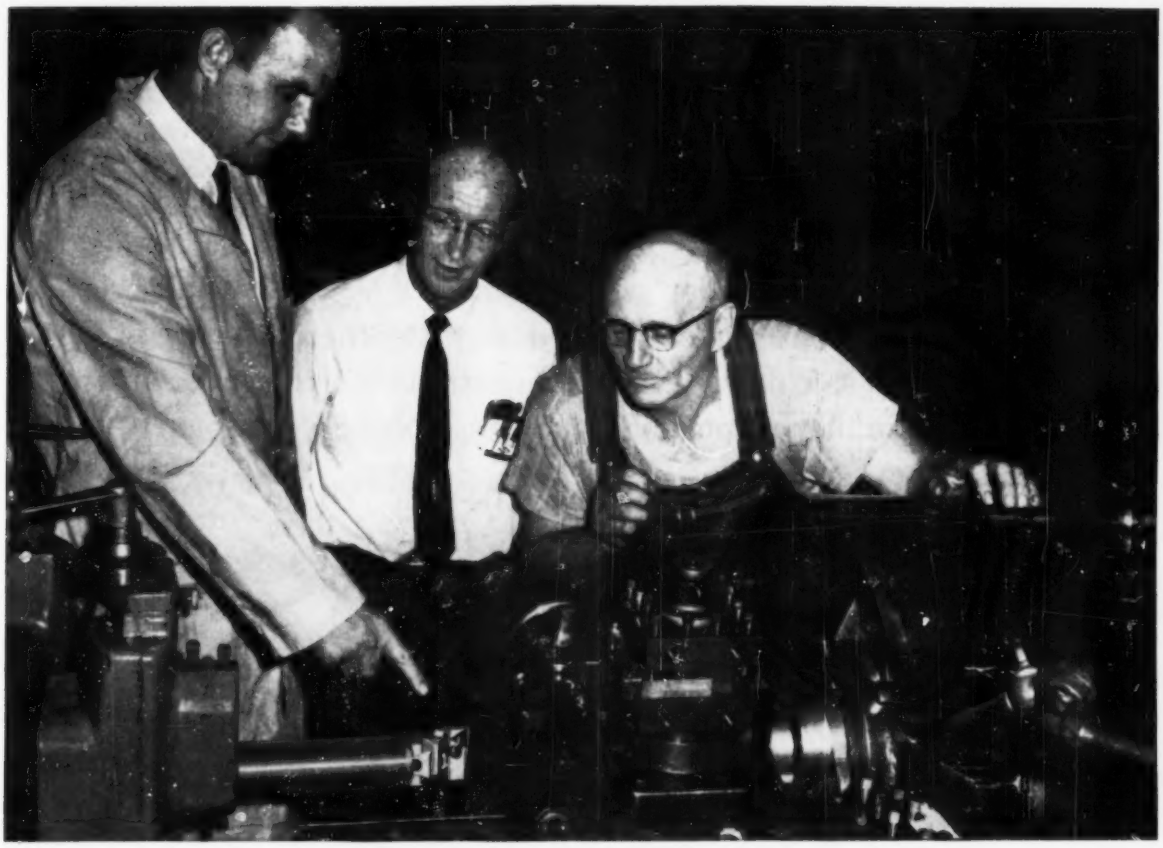

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This Adjustable Head KENNAMETAL K-Bar does the work of 5 "special" bars

Three bores on this 8620 steel casting chuck end previously required five special boring bars. Chatter and inability to hold size was a constant problem. Then the Kennametal Carbide Engineer suggested that one Kennametal K-Bar be tried for all three bores.

Although the test setup was not ideal (11-inch bar overhang), the K-Bar conclusively outperformed the five bars previously used. Increased machining speeds possible with the K-Bar produced the outstanding time reduction shown in the table. Substantial savings will also accrue through reduced tool maintenance.

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3-bore operation:
4.470 bore—.325 depth of cut
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3.220 bore—.290 depth of cut

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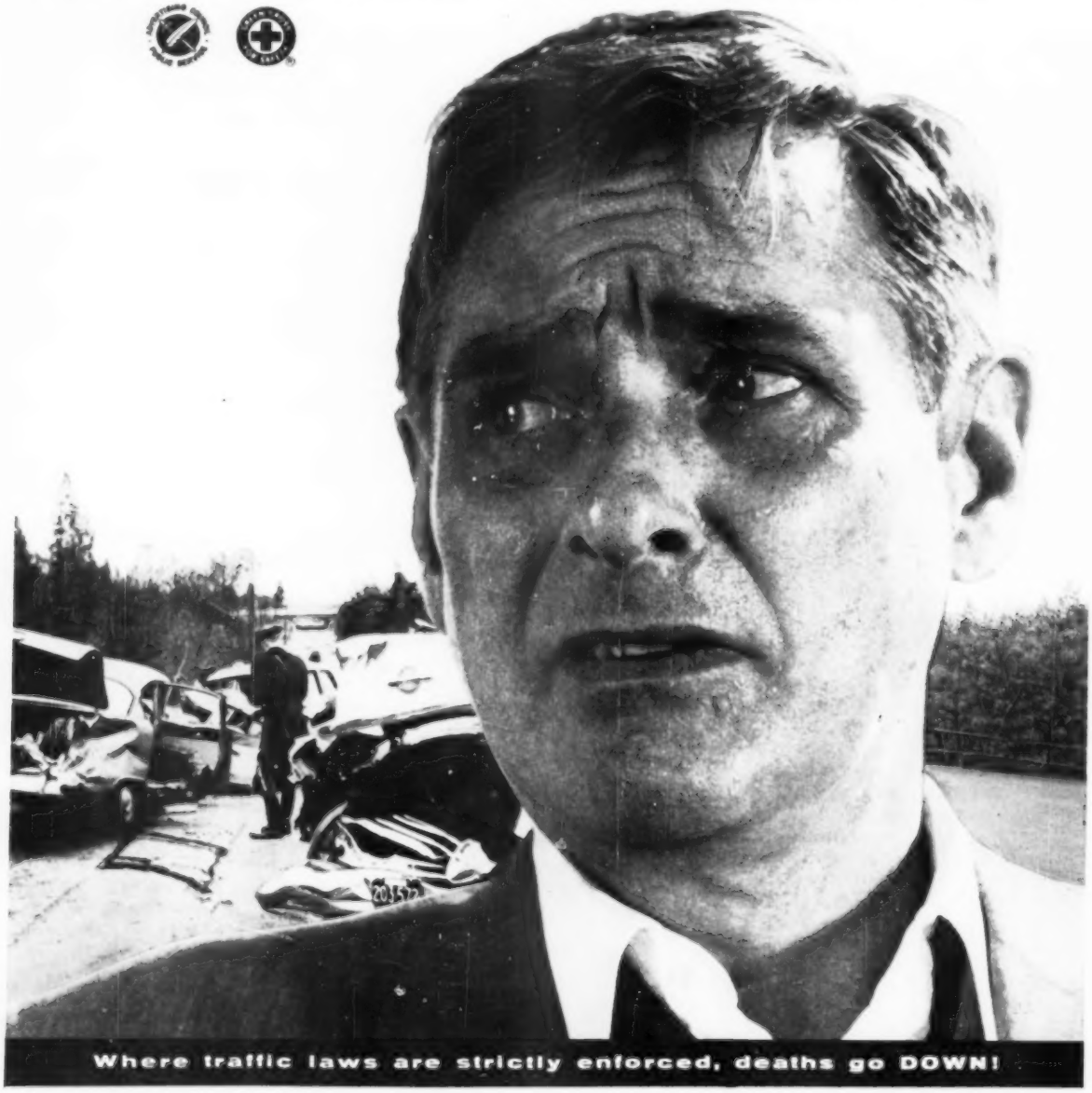

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6. Boring Mills
10. Chucking Machines
16. Drilling & Reaming Machines
23. Gear Cutting Machines
24. Grinding Machines
28. Keyseaters
29. Lathes
33. Milling Machines
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22" Model M—actual swing 22½"x336" Monarch, m.d.
24" Model M—actual swing 24.5" swing, 264" centers Monarch, m.d., late
25"x120" Boye & Emmes, vee bolt, m.d.
25"x49" centers LeBlond Geared Head, m.d., taper
25"x 0"x13" centers LeBlond Gap Sliding Bed, m.d.
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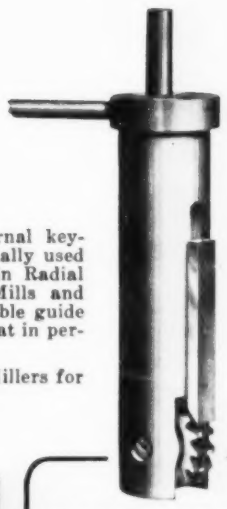

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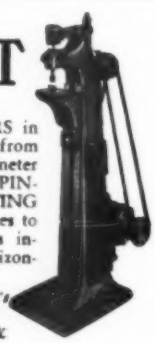

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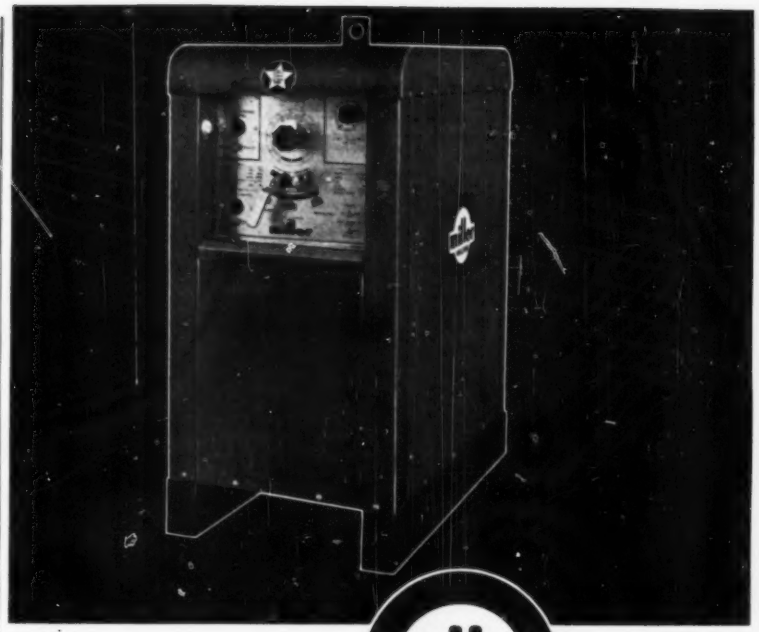

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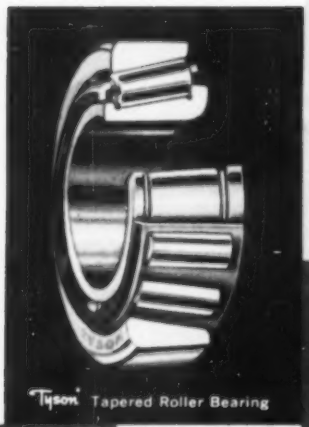

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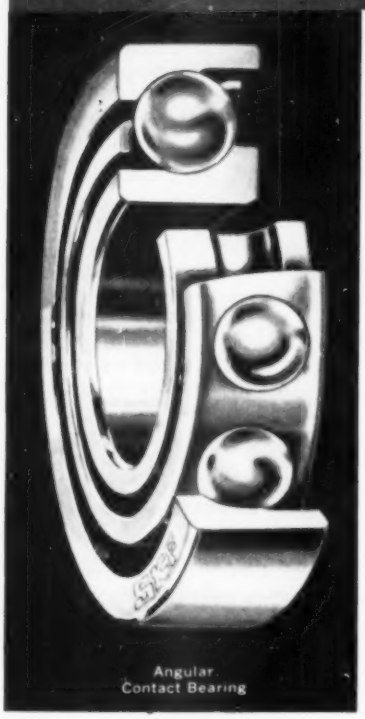

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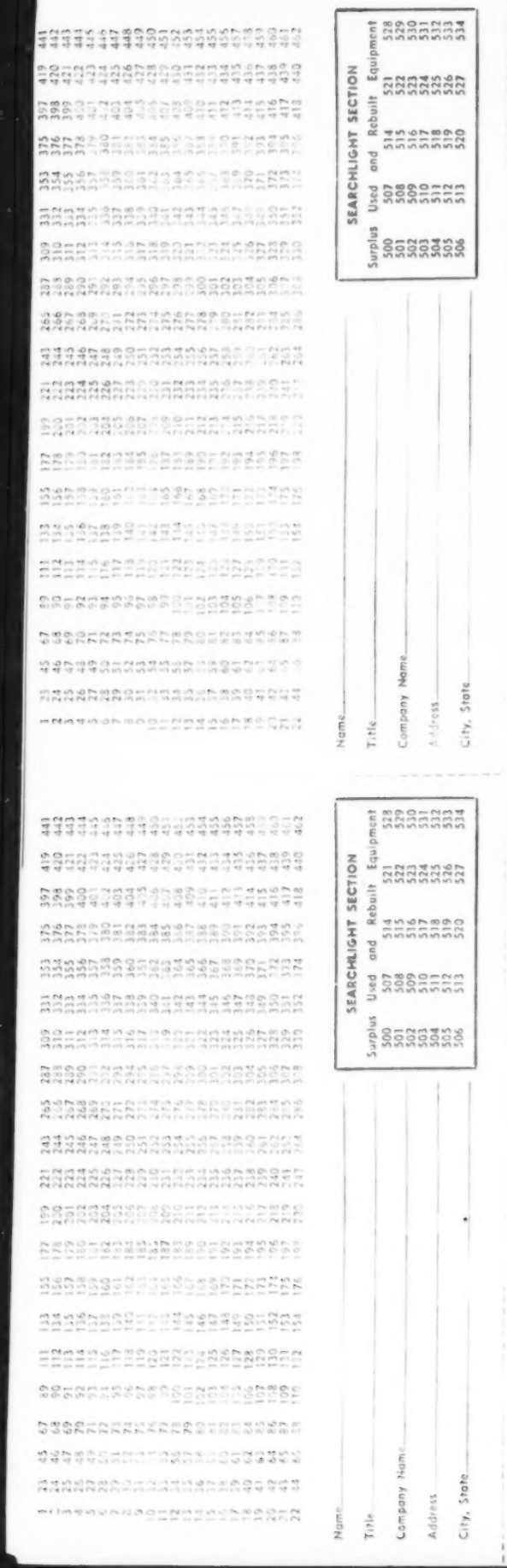

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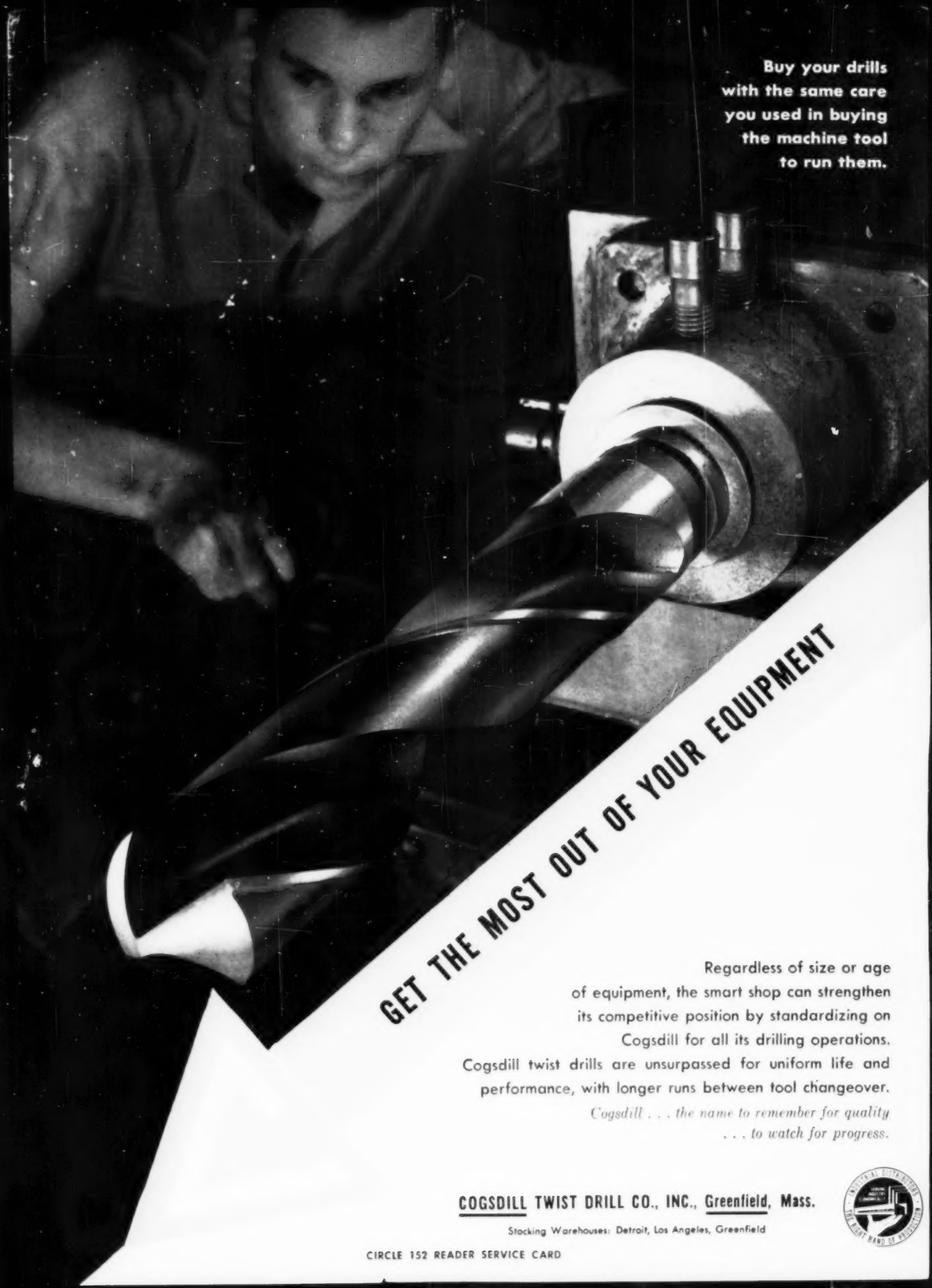

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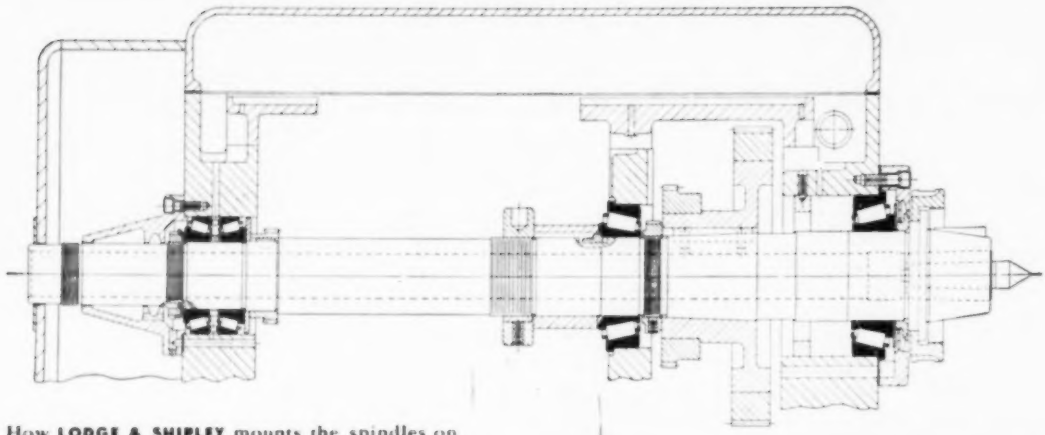

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